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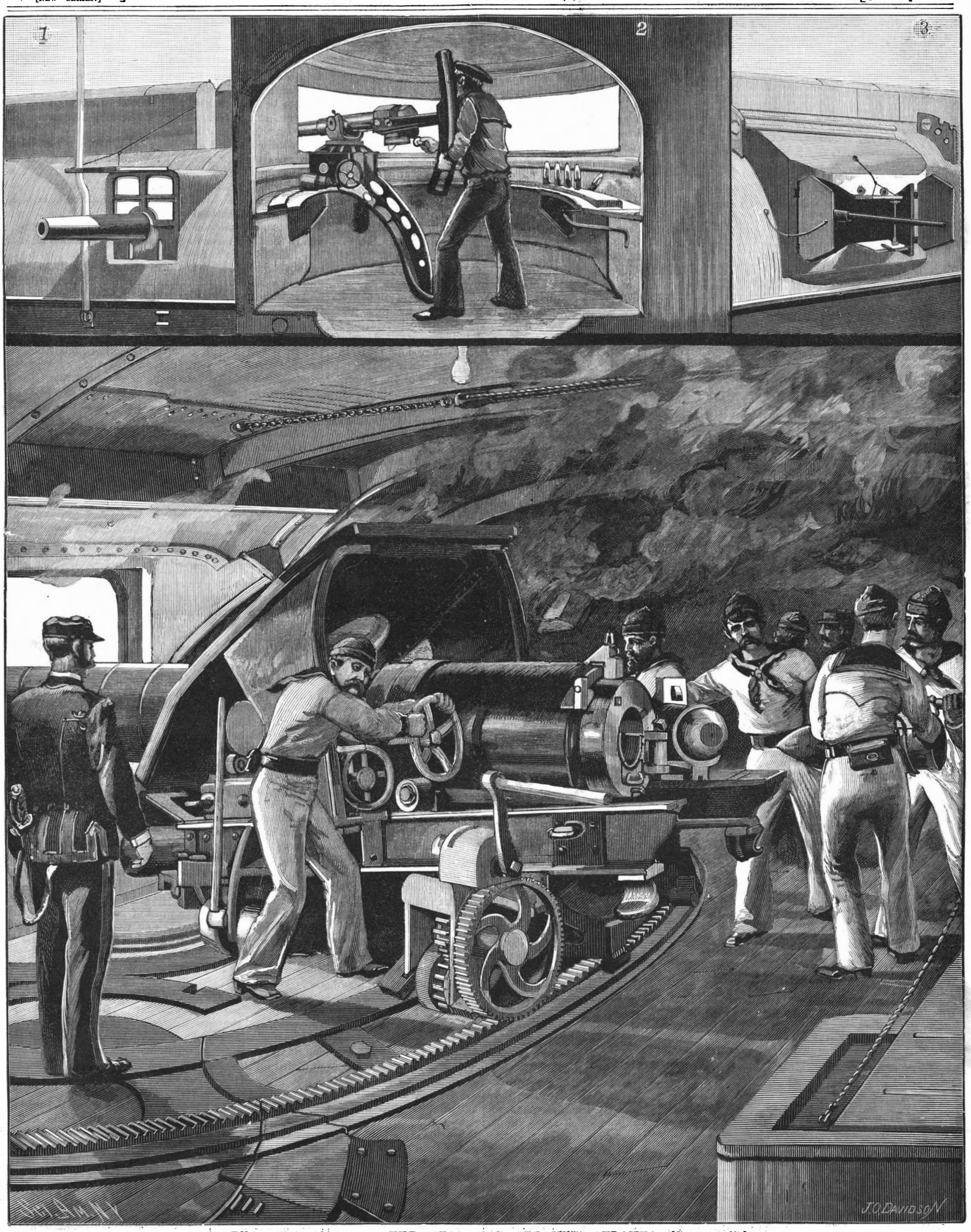


THE ARMAMENT OF THE NEW WAR STEAMER ATLANTA.—[See page 85.]

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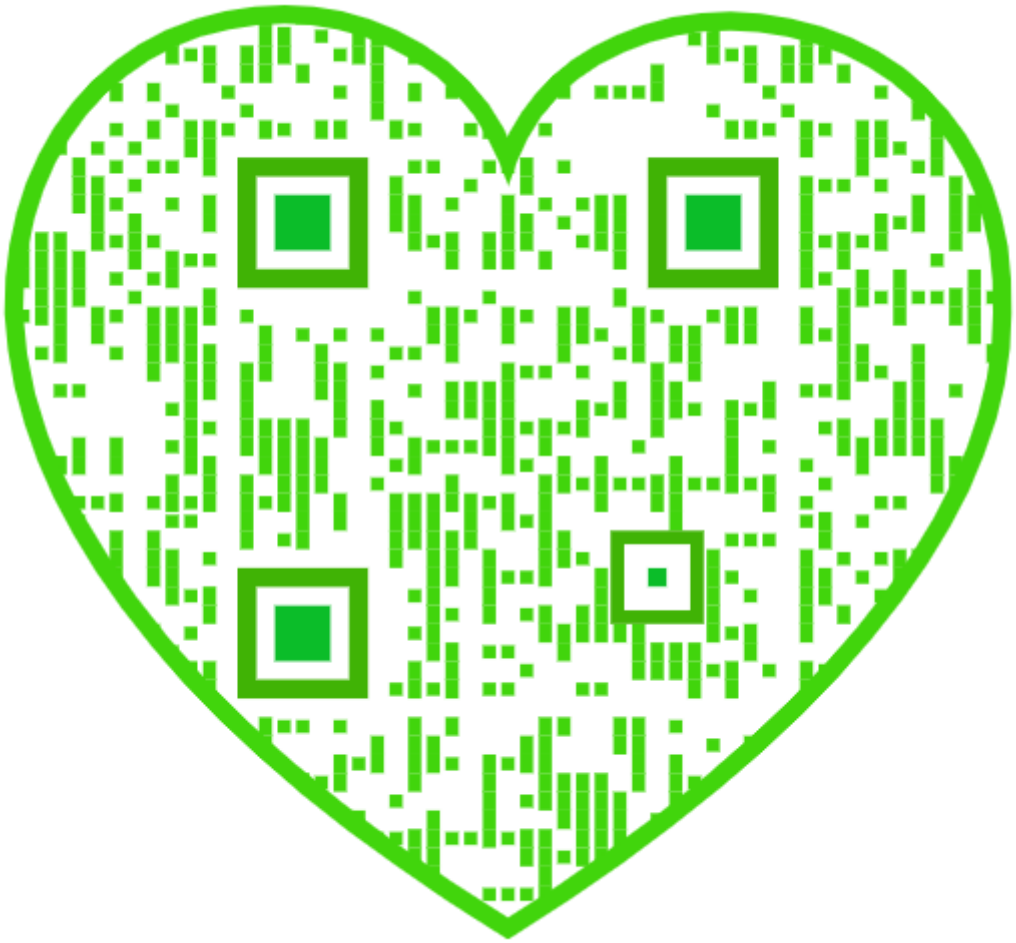

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NEW YORK, SATURDAY, AUGUST 6, 1887.


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### THE ELECTRIC LIGHTING CONVENTION.

When the National Electric Light Association was organized a few years ago, its members were few and its meetings attracted little attention. Electric lighting was in its infancy; its promoters, struggling hard to discover economical means of distribution, were not inclined to recount their experience to a meeting of rival promoters, and so it was that the first attempts that were made by zealous and long-sighted persons to form an electric light association met with little favor. There was, however, much money invested in the electrical lighting business, and the several companies expended considerable sums each on its own account for experiments, because the science of economical lighting being as yet in its infancy, all the processes from the dynamo itself to the distribution and measurement, were crude, awkward, and unreliable.

So silent and secret had been the investigations, and so diverse their experiments, that where one company had been provided with an improved method of winding the dynamo, another had hit upon improvements in distribution, in control of current, carbon setting, incandescence carbon making, etc. Taking up the advertisements of the electric lighting companies four years ago, we find one claiming superior apparatus for one thing and another for another; these being the parent companies engaged in selling material and rights.

It took two years and a deal of argument to make it clear to these electric lighting promoters that it would be of advantage to all of them to meet together and freely discuss their experiences, the nature of the obstacles which interfered, and the means, if any, that proved effective in their removal. Two years ago last winter the National Electric Light Association held its first meeting. There were about fifty members present. Papers were read on various subjects relating to the scientific and commercial departments of electrical lighting companies, and lengthy discussions as to the best means of removing certain obstacles in the way of economical generation and distribution of the current. This comparison of experiences, the experiences of practical men, be it said, bent upon placing the electric lighting business on a paying basis, was as valuable as it was interesting. The hard headed, long sighted business men present discovered that they received quite as much intelligence as they imparted and took away quite as much as they brought with them. This led others to join, until now nearly all the electric lighting men, certainly all the principal ones, are members of the association; and at the convention, which meets at the Parker House, Boston, on the 9th, 10th, and 11th instants, it is expected that there will be at least two hundred members present, and there will be read some highly interesting and important papers on administration, on steam engine types and their relative advantages in generating stations, high and low tension currents, on voltaic arc and incandescence lighting, and other matters connected with the work of operating electrical lighting plants.

Among the most interesting topics that will be brought up for discussion before the coming convention will be as to the distribution of electrical energy for the running of shafting, elevators, and the like, and another will be motors. Many electric lighting companies sell power during the day, and thus keep their engines employed all the time. As we know, there is a limit to the amount of power that can be economically furnished to one consumer, the limit being increased year by year, as apparatus for distribution becomes more and more perfect. So important an advance has been made during the past twelvemonth in this direction, that the subject is attracting more attention than ever before. Indeed, it is likely that, in the near future, small factories and workshops lying within the distributing district of an electrical lighting station will find it cheaper, as well as more convenient, to take their power from off a wire and through a dynamo than directly from a steam engine. It will save them the wages of engineer and fireman, save them in fuel and in other ways.

The two hundred electric lighting men who are expected to assemble in Boston will represent many millions of invested capital; the electric lighting business having grown, like the telephone, within a few years, from really insignificant proportions to a principal industry. The voltaic arc lighting companies alone use 50,000,000 carbon points—one New York company alone using 1,000,000. Yet it is only a few years ago that there was much opposition in the press and in the minds of the general public against electric lighting, especially voltaic arc lighting. Clever writers showed, be it said with better rhetoric than science, that electric lighting furnished an imminent danger to life as well as to property, and the terrible things that were alleged against cross-circuited currents were calculated to startle the uninformed. That was when arc lighting was in its infancy. To-day, the principal squares and thoroughfares of the metropolis are lighted by it, and there is serious talk of doing away with the gas street lamps; it girdles the city, and stretches in a long chain of light across a continent. Yet not a complaint is heard.

Every considerable city or town in the country is either lighted by it or is considering the subject. Almost every great building going up has the two little wires protruding out of the walls in a hundred places, showing that the little incandescence lights are to take the place of gas. Perhaps most remarkable of all is that the coming of electrical lighting has not seriously hurt the business of the gas companies. Indeed, in many, very many, cases it has helped the gas companies, because, since its arrival the public have got used to having more light, and those using gas have turned on more burners to make up for the unwonted illumination about them.

### Sliding of the Panama Canal Embankments.

Recent advices from Panama show that serious injury to important portions of the excavations has been occasioned by the sliding down of the embankments, due to heavy rains. In some places the great ditch has been measurably refilled, and at these points it will have to be dug out a second time at great cost. This occurrence was foreseen by Lieut. W. W. Kimball, U. S. N., when he examined the canal works in 1885. His words given in his official report, made in January, 1886, are almost prophetic, as follows:

The only other point in the plan that seems to me impracticable is the placing of the canal, the deflection of the Rio Grande and the Panama Railroad, in the narrow valley between Culebra and the Cerro Coyo, where the substratum of slipping clay is found, and where the river must be so near to and so much above the canal, with the railroad so close to the river. I cannot understand what will prevent the deflection and railroad from sliding into the canal, when it is dug, and it would seem that these would have to be carried through the hills to the right, if the river cannot be turned into the canal.

The methods of work have been indicated more or less in detail in the reports of sections, but from a broader point of view, in regarding the work as a whole, a few other points demand consideration.

The general method, with some notable exceptions, as for example the dredging in the low ground at Colon and Gatun, has been to reduce the higher levels in the canal, dumping the spoils where most convenient, but oftener into the bed of the Chagres, and leaving the Barrage and deflections of the upper Chagres for the future. The dumps have been placed 50 m. outside the canal banks, but in many places the slopes of the hillsides are such that there must be a considerable washdown into the canal. Where the dumps are in the river, the current, of course, takes down a considerable quantity of spoils, which is to some degree deposited in the dredged portion of the canal, and which will have to be dredged out again. This operation will have to go on till the river is controlled and turned out of its course, and to me it seems singular that more work has not been concentrated on the deflection of the upper Chagres, so as to turn the river from its course as soon as possible. The deflection being cut, the dumps from the works in the canal could be utilized for building the numerous embankments in the bed of the river, none of which have been begun, and all of which, as regards the upper Chagres, must be in place before the river is controlled. This much accomplished, the river bed not needed for deflection section could be used for dumping into without the possibility of there being any trouble from deposit in the canal. The longer this question is left unsettled, the greater will be the damage done by floods. It is true, the damage by the high water last December was only some tens of thousands of dollars, but it is an indication of what may occur in the future, and still the Chagres deflections are hardly begun. On the Panama side of the divide, where dredged work has nothing to fear from washdown, and where the opened canal would be most useful for removing spoils, no dredging has been done.

The lack of power drills, the seemingly too extensive use of small material, the want of good switching and double lines for spoils trains, and the ineffective excavators have all been mentioned in this report; all of which would seem to indicate that the work is being done in a slower and more expensive way than is necessary. The only explanation I have heard is that for financial reasons it was considered best to show as soon as possible a good cubic extract from the basin of the canal, and that consequently work was pushed with such material as could be easily secured, much of it small, and some of it, especially excavators, of a kind designed for Suez but not at all suitable for Panama.

### Mexican National Railroad.

This road, which has met with various vicissitudes, was sold in May to the Louisville and Nashville Railroad Company, and will become a portion of the already extensive Louisville and Nashville system. The line has about 950 miles of track, and is 3 feet gauge; it will probably be widened, however, to give a through route for the Louisville and Nashville to the city of Mexico. The Lousville and Nashville Railroad Company owns 1,696 miles of road, operates 270 miles under lease, and has a total mileage—owned, operated, and controlled—of 3,825·57 miles.

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### THE RECENT REMARKABLE RAINFALL.

*To the Editor of the Scientific American:*

Your readers may be interested in the following facts concerning the recent remarkable rainfall.

From Saturday, July 16, to Sunday, July 24 (both inclusive), there fell $7\frac{8}{10}$ inches of rain, as measured in a rain gauge at my residence on the Ridgewood Road, Maplewood, situate about one-third up the slope of the Orange Mountain, and exactly 14 miles due west from New York City.

There are 43,560 square feet on an acre; and $7\frac{8}{10}$ inches equals 0·608 of a foot; 43,560×0·608 equals 26,484 cubic feet to the acre; equal to 165,525 imperial gallons, equal to a cube of water very nearly 30 feet on a side, which weighs nearly 74 long tons!

Every one knows that rain is the condensed vapor in the air falling as drops of water, and that it gets into the air from the evaporation of water on the earth, by the action of heat derived ultimately from the sun. Now it has been determined by accurate experiments, that if we could put all the heat given out by the burning of 20 pounds of dry white pine into a cubic foot of water, it would convert the water entirely into vapor, having the ordinary temperature (say 60°) of the air.

When vapor (which is as transparent as air) condenses into water, the heat which kept it as vapor must evidently go out from it. The data give us some curious figures. As we had a fall of 26,484 cubic feet to the acre, it would require 20×26,484 or 529,680 pounds of dry pine wood to send this mass of water again into vapor. A cord of dry white pine is said to weigh 1,868 pounds, and 529,680 divided by 1,868 gives 283 cords as the quantity of pine wood required, in burning, to evaporate our recent rainfall on an acre; and before that rain could fall on the acre, just as much heat as is given out in the burning of 283 cords of pine wood had to be lost to the vapor and given out to the air above us. Should we be surprised that a fall of rain (except it be very cold) rarely cools the air?

From observations of Dr. W. J. Chandler, of South Orange, N. J., made during ten years and five months, as published in the report of the Geologist of New Jersey, for 1880, the mean annual rainfall at South Orange (about 1½ miles from my residence) is 44·73 inches. Hence we have had in our recent rains a little over one-sixth of our whole annual quantity.

This recent fall has, however, been surpassed, as appears from the record which Mr. W. A. Whitehead has kept in Newark, N. J., for over forty years. From his register we extract the following remarkable rainfalls per month:

| | | |
|---|---|---|
| For August, 1843 | 22·5 | inches. |
| " " 1853 | 11·2 | " |
| " " 1867 | 10·6 | " |
| " " 1875 | 10·2 | " |
| " April, 1854 | 11·4 | " |

We may reach 10 or 11 inches for the whole of this month's fall—we hope not—but we do hope that 22½ inches will ever continue to beat the New Jersey record.

ALFRED M. MAYER.

Stevens Institute of Technology, July 25, 1887.

## The Celestial World.

### TOTAL ECLIPSE OF THE SUN.

On the 19th of August, a total eclipse of the sun will occur. Our satellite, as she passes between us and the sun, will entirely hide the bright solar orb from the view of those who are on the right portion of the globe, and under the right conditions to behold the majestic spectacle.

The conditions are that the center of the moon passes over the center of the sun, and that the moon's apparent diameter is greater than that of the sun. These conditions occur on the 19th. The moon passes directly between the sun and the earth. The moon being in perigee, or at her nearest point to the earth, has her maximum diameter. The sun, being nearly in apogee, has nearly his minimum diameter. The moon's diameter at the time of the eclipse is 32′ 47″. The sun's diameter at the same time is 31′ 37″. Therefore the moon's diameter exceeds that of the sun 1′ 10″, and she must necessarily hide the magnificent orb from mortal view.

The moon, as is well known, casts a shadow in the form of a cone, with the point extending toward the earth. On the 19th, the shadow reaches the earth, but is comparatively very narrow, being so near the sharp point. The shadow is seldom much more than a hundred miles wide. It is called the path of totality, or the line of the central eclipse, and all observers within this belt of the moon's dark shadow will behold a total eclipse of the sun. The eclipse is invisible in the United States. The inhabitants of a portion of the eastern hemisphere are more favored.

The path of totality for the coming eclipse commences in Germany, extends through the rest of Europe, traverses the whole of Asia, crosses Japan, and ends in the Pacific Ocean. Astronomers from all parts of the civilized world will establish themselves in fitting localities, and improve the opportunity to seek for a solution of the momentous problems that can only be studied during the few precious moments of a total solar eclipse. Fortunately, the path of totality affords more accessible conditions for observation than usual. The most favorable stations will be at some distance east from the commencement of the path of the dark shadow, for the farther east the observer is, the later will the eclipse occur.

The sun will rise in the middle of the total eclipse at Nordhausen, in Saxony. The eclipse will occur at noonday in Irkoust, Siberia, and at sunset when it reaches its limit in the Pacific Ocean. The duration of the eclipse at Vilna will be 2 m. 15 sec.; in the environs of Moscow, it will be 2 m. 30 sec.; at Perm, it will be 3 m. The greatest duration will be at Bain-Gol, in China, where it will be 3 m. 50 sec.

### THE COMET FINLAY.

This comet, the first one discovered in the present year, has thus far found no rival to dispute its claim to the title of "the great southern comet of 1887." It was first observed by a farmer and a fisherman near Cape Town, at the Cape of Good Hope, on the 18th and 19th of January. It was seen the same night at the Observatory of Cordoba. On the 20th, Mr. Todd discovered it independently at the Observatory of Adelaide, and observed it till the 27th. On the 22d, Mr. Finlay observed it at the Cape of Good Hope, and continued his observations till the 29th. Mr. Cruls observed it at Brazil from the 23d to the 25th. Mr. Tebbut observed it in Australia on the 28th and 30th. The moonlight after that time prevented all farther observation. The comet passed its perihelion on the 11th of January, and must then have almost touched the solar atmosphere, like the great comets of 1843, 1880, and 1882. After that time, the comet receded from the sun with great rapidity.

The celestial visitor was beautiful to behold as it hung in the southern sky, during the few days that it was seen from the 18th to the 29th of January. The tail of the comet was straight, long, and narrow, like those of the comets of 1843 and 1880, measuring about 30° in length. Its remarkable feature was that it possessed no well defined nucleus, no appreciable condensation.

If the vicinity of the sun had been carefully observed on the 11th of January, the date of perihelion, the comet, like that of 1882, would probably have been visible to the naked eye, almost grazing the sun, and taking on the form of a pale nebulosity. It is incomprehensible that no southern astronomers caught a glimpse of this wanderer from the star depths as it winged its rapid flight away from the sun, between the 11th and the 18th, when it must have shone in its greatest splendor.

The great comets of 1843, 1880, 1882, and 1887, show so remarkable a resemblance in the elements of their orbits that, if anything were certain about comets, the conclusion would be inevitable that they all belong to the same family.

### DISTINCTIONS WORTHILY BESTOWED.

By a decree of the President of the French Republic, issued on the 16th of April, the cross of a chevalier of the Legion of Honor was bestowed upon M. Paul Henry, of the Paris Observatory, for his remarkable success in photographing the stars.

By a decree of the Emperor of Brazil, issued on the 19th of March, the cross of the commander of the Order of the Rose was bestowed upon M. Camille Flammarion, the distinguished astronomer and publisher of "L'Astronomie."

## Microscopical Notes.

*Mounting Perishable Crystal Sections.*—A mounting medium should be transparent, and colorless if possible, of an index of refraction having reference to the substance treated, and free from moisture. It must not be a solvent of the matters that it is employed to preserve. As media of this kind especially worthy of attention for mounting perishable crystals, or such as lose their polish or become opaque in Canada balsam, as well as in the air, Professor Johnstone, of Johns Hopkins University, recommends the following:

1. Finest gum copal dissolved in chemically pure amylic alcohol.

2. Finest copal dissolved in chemically pure absolute alcohol

3. Dammar resin dissolved in rectified spirit of turpentine. No heat should be used in making these solutions, and the resultant liquid should be very thick.

4. Dammar resin dissolved in well boiled balsam copaiba.

5. Boiled Chian turpentine dissolved in boiled balsam copaiba.

6. Dammar resin boiled until the rising scum becomes nearly dissipated, the remaining scum to be removed with a spoon.

*How to Draw with the Camera Lucida.*—In order to draw a picture by means of the camera lucida without painfully straining the eyes, it is necessary that the microscopic image and the paper and pencil be uniformly illuminated. If the image has, in comparison with the paper, too strong a light, the pencil will be seen with difficulty, if at all. On the contrary, if the paper, in comparison to the image, be too strongly illuminated, the delicate outlines of the latter will be indistinct. This difficulty may be remedied by throwing either the image or the paper into a shadow. Both may be done simply with the hand, or by a properly constructed screen of paper, or by a disk of pasteboard set up at some distance, and the like. A few trials with the microscope with different magnifications will afford the necessary experience for properly managing the light. In tracing the outlines of the image under the camera, the pencil used should not be too hard and the lines should be very light.—*The Microscope in Botany.*

*Preserving Polyzoa.*—A new method of preserving polyzoa and other low forms of life has, according to *Science Gossip*, been discovered by Dr. A. Frothinger. Crystals of chloral hydrate are dropped into the vessel of water in which the polyps have been placed, and in a short time the creatures become insensible, when they can be placed in alcohol. The advantage claimed for this method is that the polyps will remain expanded, and can therefore be preserved when exhibiting all their beauty of structure. The chloral acts, it would seem, in much the same manner as it affects the higher organisms, that is, as a narcotic.

*For Fixing Cellular Structure* for prolonged study under the microscope, Professor Ranvier, in a lecture lately delivered at the College of France, highly extols osmic acid.

*Double Staining Botanical Preparations.*—The following method is suggested by Professor J. J. Rothrock, of the University of Pennsylvania:

Immerse the section in an extremely weak solution of aniline green for twenty-four hours. At the end of twelve hours the section will most likely have absorbed all the green, in which case add two drops more of the mother solution. Then take a middling strong solution of Beale's carmine, and immerse the section in it for from one to five minutes only; then prepare with alcohol and oil of cloves in the usual way, bedding in dammar lac or Canada balsam.

*Zinc Cement Rings.*—Mr. Van Allen notes, in the *Amer. Monthly Microscopical Journal*, that zinc cement rings, if they are at all recent, are apt to be destroyed by oil of cedar used as an immersion fluid.

*Mounting Butter Crystals.*—Dr. Thomas Taylor, of the Department of Agriculture, says: "A practical microscopist will readily perceive that, from the very nature of the crystals, great care must be exercised in mounting them. The globular crystals should not be crushed, neither should they be exposed to light except when necessary, or to a temperature of over 70° or 75° Fah.

"In order to crystallize solid fats and show their normal crystals, it is necessary, first, to boil them with sweet oil. When cold, the composition should be of the consistency of butter. Cacao butter should be made so liquid when cold that its crystals will swim incrusted on the surface of the oil. When a little of this floating incrustation is bruised gently in oil and mounted, beautiful discoid crystals will appear under the microscope. When normal crystals of fat of any description are mounted in oil, it is difficult to preserve specimens of them for a long period, owing to their tendency to dissolve, especially at temperatures exceeding 80° Fah."

## Curious Way of Making Steel Tubes from Solid Rods.

At a recent meeting of the Physical Society, Berlin, the President, Prof. Du Bois-Reymond, gave an account of a communication which had been made by Siemens at the last meeting of the Akademie der Wissenschaft. A steel tube 10 cm. long, with perfectly smooth external and internal surfaces and extremely uniform bore, and whose walls are apparently of perfectly equal thickness at all points, was prepared by the following method, patented by Mannermann in Bemscheid. Two rollers, slightly conical toward their lower ends, are made to rotate in the same direction near each other; a red hot cylinder of steel is then brought between these cylinders and is at once seized by the rotating cones and is driven upward. But the mass of steel does not emerge at the top as a solid, but in the form of the hollow steel tube which Siemens laid before the meeting. Prof. Neesen gave the following explanation of this striking result: Owing to the properties of the glowing steel, the rotating rollers seize upon only the outer layer of the steel cylinder and force this upward, while at the same time the central parts of the cylinder remain behind. The result is thus exactly the same as is observed in the process of making glass tubes out of glass rods.

## Poisoning by Nutmeg.

A case of poisoning by nutmeg is recorded in the *British Medical Journal*, in which one nutmeg had been eaten by a patient as a cure for diarrhœa. It caused him to become giddy, stupid, and very drowsy all next day. The narcotic properties of these seeds, and of others of the same natural order, do not appear to be generally known, and seem worthy of investigation.

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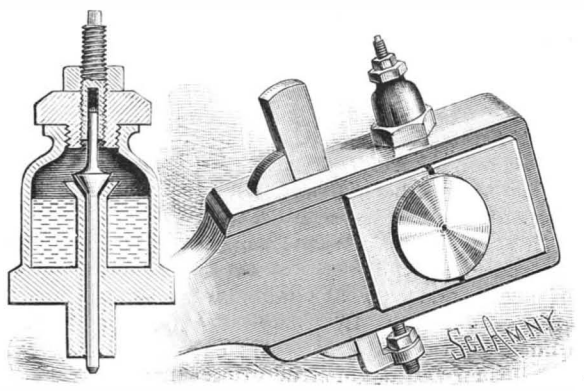
### AN IMPROVED LUBRICATOR FOR CRANK PINS, ETC.

An oil cup designed to provide for the regular delivery of small and readily regulated quantities of oil to the revolving crank pin of a locomotive, and one that will not discharge any oil except when the engine is in motion, is shown in the accompanying illustration, and forms the subject of a patent issued to Mr. E. P. Hussey, of Ellis, Kansas. In the center of the cup is an upwardly extending tube, with flaring top opening just above the level of the oil, the cap or cover of the cup being fitted with a plug which has a vertical bore in its lower end. The valve has a downwardly extending spindle, fitting loosely within the bore of the tube in the cup, while its stem projects upward within the bore of the plug. The lower projection of the cup is applied to the bearing of the crank pin, in a socket provided therefor, either by a set screw or by threading the lower projection of the cup and the walls of the socket. After the device has been applied, the motion of the crank causes the valve to rise and fall, while also agitating the oil in the cup so that it will strike upon the upper face of the valve and drip downward drop by drop, to be delivered by the spindle directly to the crank pin. The play of the valve, by which the flow of oil is regulated, may be limited as desired by adjustment of the threaded plug in the cover or cap of the cup.

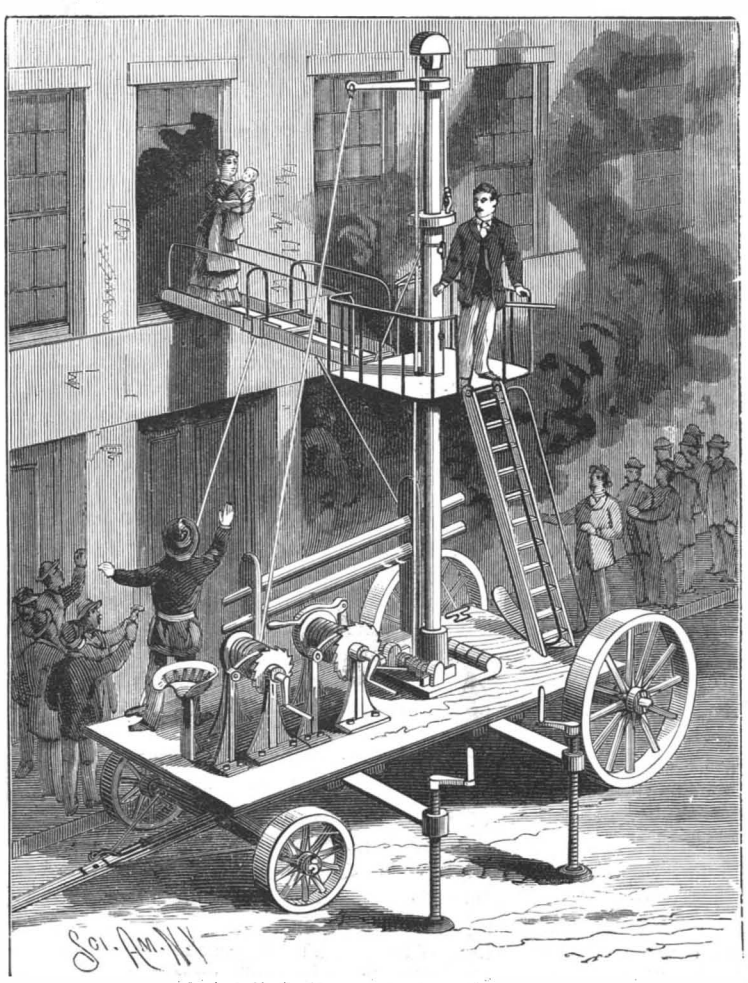


HUSSEY'S LUBRICATOR.

### AN IMPROVED FIRE ESCAPE.

The fire escape illustrated herewith, which has been patented by Mr. Henry Opp, of Belleville, Ill., embodies a combination of valuable features, including an extensible mast, a cage with bridge and ladder connections, and means for adapting the truck to inequalities of the ground, the invention being also applicable to derricks, signal stations, etc. The mast is of metal, in sections of tubular form, one end of each section forming a dowel which enters the end of the adjacent section, two of these sections being shown in the rack at one side of the truck. To adapt the truck to inequalities of the ground, sliding arms are fitted to its under side, which engage screw props or legs, these being readily moved out of the way when not required. When service for the higher floors of a building is required, the ropes are slackened and the mast is overturned, when the cage and upper section are removed, and other tubular mast sections applied, to build up the mast to the required extent. The drum shown at the left in the picture is then rotated, drawing upon a rope attached to an arm extending from the top of the upper section, whereby the mast is elevated, and held in upright position by means of keys. Firemen now enter the cage, and this is drawn up by rotating the other drum, the cage being secured to a vertical sleeve around the mast, from which sleeve a rope passes over a pulley at the top of the mast, thence downward and to the drum. To opposite ends of the cage are pivoted a bridge and a ladder, the bridge being in sections which slide upon each other, and both bridge and ladder being readily swung upward out of the way when not required in service. The cage and bridge are prevented from rotation by means of guy ropes, and pawls, ratchets, and brakes hold the parts firmly in position.

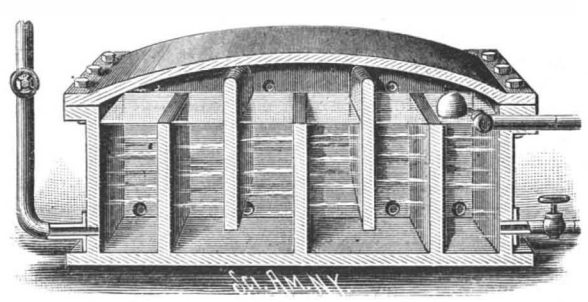
For further information concerning this invention address Mr. Curt Heinfelden, Belleville, Ill.



OPP'S FIRE ESCAPE.

### AN IMPROVED STEAM TRAP.

A steam trap that is designed to prevent impurities in the condensed water from passing to the pump, whether such impurities are of a kind that would naturally sink by gravity or float on the surface of the water, is shown in the accompanying illustration, and has been patented by Mr. James Motley, of No. 26 Liberty Street, New York City. The trap consists of a closed casing with an inlet pipe at one end and an outlet pipe at the other end, these pipes opening into the casing near the bottom, while at right angles to them, within the casing, are transverse partitions, extending alternately from the casing bottom upward to within a short distance of the top of the casing, and downward to within a short distance of the casing bottom. The steam and condensed water entering by the first pipe fill the first compartment and overflow its partition, thence the water passes under the next and over the third partition, and so on for as many partitions as there are in the trap, causing all heavy particles to settle at the bottom between the partitions before the water reaches the outflow pipe at the end. All sediment that may accumulate at the bottoms of the compartments is forced through blow-off cocks at the bottom of each, to be opened as required, according to the purity of the water, and any scum floating on the surface of the water is discharged in like manner from blow-off cocks arranged on the water level. A float valve is arranged to permit the escape of surplus water, when the whole supply is not drawn off through the regular outflow pipe at the bottom.



MOTLEY'S STEAM TRAP.

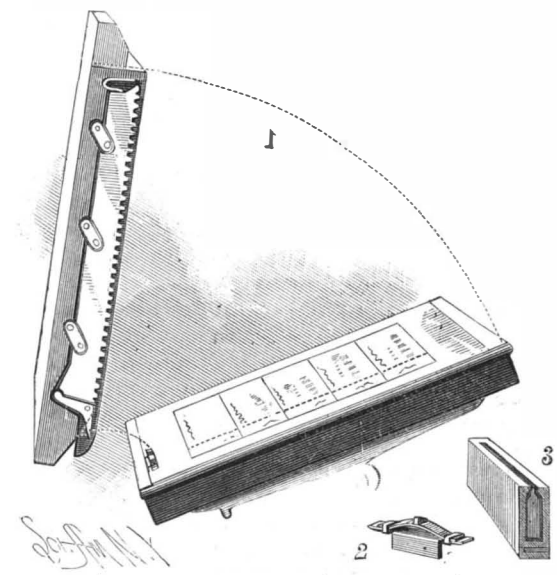
### AN IMPROVED REVERSIBLE SCREW DRIVER.

A screw driver adapted for a variety of uses is shown in the accompanying illustration, and has been patented by Mr. Theodore Troy, of Three Rivers, Mich. Besides the main bit, the blade has side bits, either or both of them adapting the tool to be used in various positions, and to be applied either longitudinally or sidewise to the screw. The handle is formed with a transverse socket, adapting it to receive a bar or lever when the main blade is applied sidewise to the screw. The wooden portion of the handle is fitted with annular cheek pieces, having inwardly projecting circular flanges, forming bearings for a circular casting in which the socket is formed, the casting having ratchet teeth around the center of its outer surface, the wooden portion of the handle being further recessed to receive a pawl caused to engage with the ratchet teeth by a rubber spring. Within the ferrule is a spring for holding the blade in position, and the socket in the handle is tapered at both ends to form a double or reversing socket.

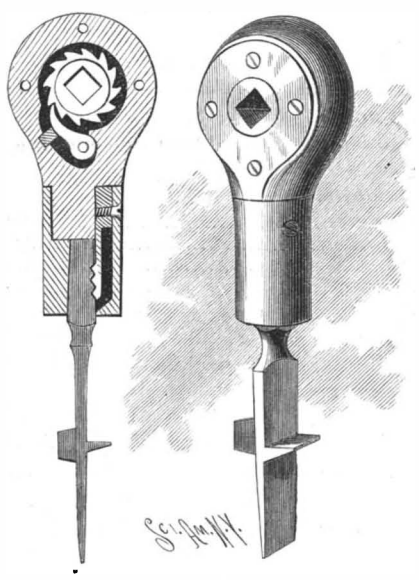
THERE is to be an orange-wine factory established in Florida by some Englishmen. Orange wine, when properly made, is said to be very fine.

### AN AUTOMATIC PERFORATOR FOR PRINTING PRESSES.

The illustration herewith, which forms the subject of a patent issued to Messrs. George and Robert Kennedy, of New Westminster, British Columbia, Canada, provides a device for use on printing presses, for perforating paper in the operation of printing, the perforator dropping below the surface of the type when the form is being inked, but being raised up into position as the impression is given. Fig. 1 is a vertical transverse section of the bed and platen of a press, showing the application of a perforator, Fig. 3 is a detail view of a hollow rule in which the perforator works, and Fig. 2 represents one of the forms of yielding contacts used on the edge of the platen for operating the perforator. The hollow rule is formed of metal strips connected together in any convenient way, a serrated knife-edged cutter being supported in the hollow upon links pivoted to the back of the cutter and to a strip forming the back of the hollow rule. This perforating device is clamped in the form in the chase in the same manner as an ordinary rule, in the position in the form at which the perforations in the printed sheet are desired. Just before the contact of the paper with the face of the type in printing, the yielding contact on the edge of the platen strikes the outer end of an angled lever pivoted in the hollow rule, swinging the cutter forward and outward on its links, causing its serrated edge to project above the face of the type sufficiently to insure the perforation of the paper on that line, as the impression is given. As the platen is removed, the yielding contact is withdrawn from the end of the lever, and a spring at the other end of the hollow rule causes the cutter to swing back into its former position, so that it will not be inked by the rollers passing over the form.



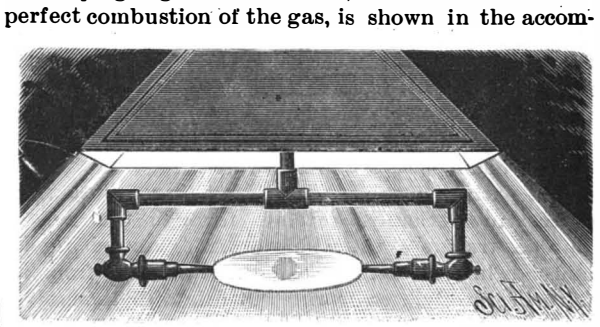
KENNEDY'S PERFORATOR FOR PRINTING PRESSES.



TROY'S REVERSIBLE SCREW DRIVER.

### AN IMPROVED GAS BURNER.

A novel arrangement of gas burners, by which the points of the burning jets issuing from two burners will impinge against each other, and thus insure a more perfect combustion of the gas, is shown in the accom-



SHEEHAN'S GAS BURNER.

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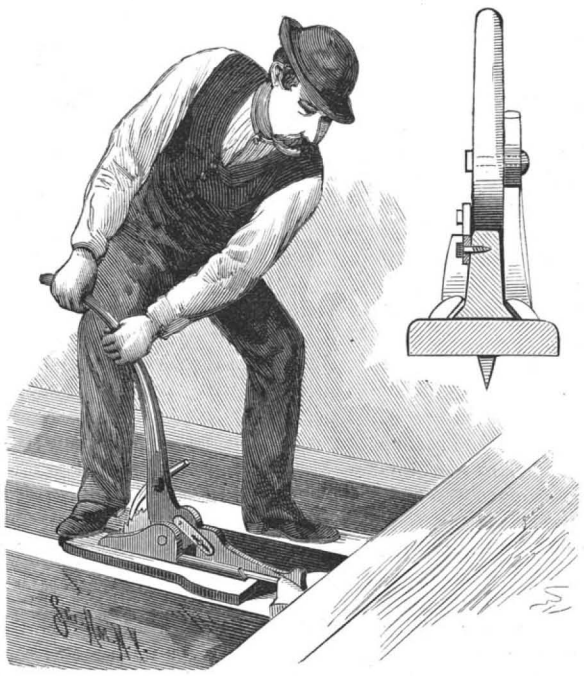
panying illustration, and forms the subject of a patent issued to Mr. Thomas Sheehan, of No. 374 East Main Street, Louisville, Ky. The relative position of the burners beneath the shade is indicated in the drawing, it being considered that the best effects will be obtained in ordinary practice when the two ignited jets overlap about a quarter of an inch, this being effected by turning the gas on or off until the ignited jets are of the re-

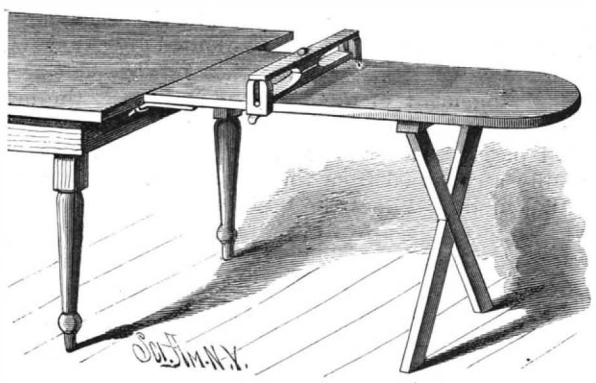


BAYER'S FLOOR CRAMP.

quired size. These burners are designed to prevent the production of any smoke or the giving off of any unconsumed particles, thereby yielding more light for a given amount of gas consumed.

### AN IMPROVED IRONING BOARD.

A simple form of ironing board, having a readily adjustable clamp, whereby shirts or other articles may be firmly held while being ironed, is shown in the accompanying illustration. The board has a cleat or cross bar on its under side, near one end, to which are hinged crossed legs, while at the other end are two bent prongs or bars that may be readily inserted in apertures formed on the under side of one end of a table of



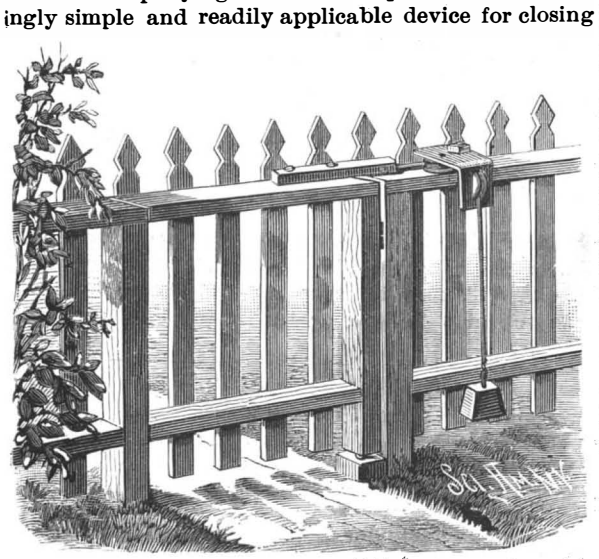
McCORMICK'S IRONING BOARD.

any ordinary form, in connection with which the ironing board may be set up. The clamp consists of slotted end blocks and upper and lower spring bars, extensions of which ride in the slots of the end blocks, turn buttons being secured to the lower faces of the end blocks. When the clamp is placed upon the article to be ironed, the turn buttons are moved so that one end of each button will extend beneath the table, and the article will be firmly held.

This invention has been patented by Mr. Robert E. McCormick, of New London, Huron County, Ohio.

### AN IMPROVED DEVICE FOR CLOSING GATES.

The accompanying illustration represents an exceedingly simple and readily applicable device for closing



RIGG'S DEVICE FOR CLOSING GATES.

gates, which has been patented by Mr. James W. Rigg, of Mount Carmel, Ill. Upon the inner or hinged end of the top of the gate frame is fastened a bar, which projects beyond the gate, over the top horizontal beam of the fence. At the rear of this bar an angular frame is secured upon the top beam of the fence, and in this frame are journaled two pulleys, one in a horizontal and the other in a vertical position, the latter projecting through a slot in the frame. A cord attached to the end of the bar upon the gate passes around the horizontal pulley and then over the vertical pulley, through the slot in the frame, a weight being attached to the other end of the cord, near the ground. It will be seen that, when the gate is opened, the bar projecting beyond its hinged end operates as a lever, raising the weight, and when the gate is not held open, the weight will automatically close it.

### A FLOOR CRAMP FOR CARPENTERS, JOINERS, ETC.

The manner of operating a simple, handy, and inexpensive implement for tightly closing up the joints of flooring boards and deck planks, prior to nailing or otherwise securing them, is shown in the accompanying illustration, the small figure being a vertical cross section of the tool. The device consists of an elongated bed plate having backwardly projecting spurs on its bottom, and an upright hand lever carrying a pawl at the base of its arm. This lever is made with a cam head embraced by and turning between a toothed rack and a supporting flange rising from the bed plate, a push bar sliding in parallel bearings on the bed plate, made with a cross head and connected by a slotted link to the cam of the lever. The tool is very powerful, and is designed to cramp from eight to ten boards at a time if desired, the pawl engaging the rack teeth to hold the boards tightly in position when the hand is removed from the operating lever. The device may also be used for cramping the wainscoting of a room, for clamping doors together, and for a variety of similar work.

This invention has been patented by Mr. Alexander S. Bayer, and further information relative thereto may be obtained of Mr. Charles F. Mott, No. 90 Argyle Street, Halifax, N. S., Canada.

### AN IMPROVED SURGICAL INSTRUMENT HOLDER.

An improved device, whereby various implements, such as scissors, hooks, saws, lancets, or various forms of blades, may be readily and quickly inserted alternately in one handle, and held firmly therein, is shown in the accompanying illustration. It has been recently patented by Mr. Leonhard Schwab, of No. 102 Graham Avenue, Brooklyn, E. D., N. Y. The handle has a vertically slotted head, with a recess on one side of the base of the slot, in which a thumb wheel is held upon a threaded pin projecting through the handle from side to side. In one edge of the handle is a concave surface whereby the milled periphery of the thumb wheel may be readily engaged by the operator, and projecting through the handle above the thumb wheel is a rivet. The shank of the instrument, as shown in the detail views, is made flat, of a width equal to that of the handle; it has a central longitudinal slot, and aligning semicircular recesses on each side. When the shank of the instrument is inserted in the handle, the slot in the shank passes over the rivet and the threaded pin, the shank coming in contact with and resting upon the bottom of the handle slot, when a slight turn of the thumb wheel fixes the tool firmly in the handle. With this construction one handle will answer for a great many tools.

### AN IMPROVED METHOD OF RAISING BREAD, ETC.

An invention which has for its object the protecting of dough, etc., from currents of air while being prepared for baking, keeping its surface in a moist condition, and retaining the heat of fermentation, is illustrated herewith. It forms the subject of a patent recently issued to Mr. Joseph D. Cox, of Rochester, N. Y. One of the figures shows a convenient form of vessel to serve both purposes of mixing and raising, and the other is a more desirable form of chamber for the second raising, when the dough is made into loaves, and placed in pans or tins, according to the course ordinarily followed by housekeepers.

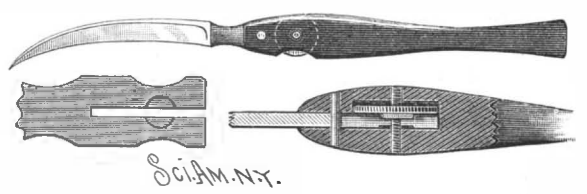
In both cases the down-projecting rim of the cover sits into an annular channel or trough, filled with water or other liquid, preventing the inward passage of air, but permitting the escape through the water of gases and vapors generated by the fermentation within. The length of time the dough is left in the two vessels varies according to the temperature, but the periods are about the same as ordinarily occupied, the mixing pan, for instance, being employed to keep the dough in over night, and the other vessel, placed in a warm situation, for the second raising during an hour or two in the morning. By thus keeping the surface of the dough moist, while facilitating the escape of the gases of fermentation, it is sought to prevent the forming of a tough, hard upper crust, while making the bread more palatable and digestible.

### AN IMPROVED SCAFFOLD BRACKET.

A bracket designed to be cheap, durable and efficient, and that is adapted to serve a variety of uses, is shown in the accompanying illustration. It forms the subject of a patent issued to Mr. William H. Higgins, of Forest City, Pa. The parts are so made that the platform-supporting arms of the bracket may be adjusted to a horizontal plane, and the bracket may be attached to

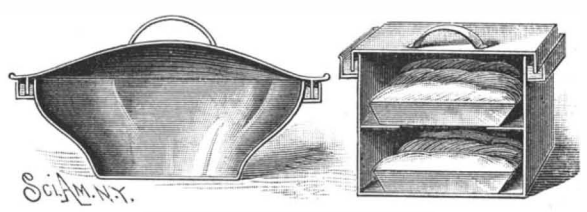
HIGGINS' SCAFFOLD BRACKET.

a roof or to the upper or under side of a ladder. In connection with a ladder the bracket may be used as an entirety, or may be separated into three distinct parts, which, with the aid of double hooks, may each be secured to the ladder. The side bars used in this bracket are formed with peculiar shaped, flattened, hooked ends, the ends of the hooks extending outward at an angle from the bars, and having spurs extending



SCHWAB'S SURGICAL BLADE AND HANDLE.

outward from the hooks, the bars having elongated slots in connection with these hooked ends, in which are pivotally mounted S hooks, the latter carrying adjustable leaves, with sleeves rigidly fixed thereto to slide on the hooks. The illustration shows only a few of the many uses to which this bracket may be applied, the small figure indicating the form of a slotted extension for a foot for the bottom of the ladder, to secure

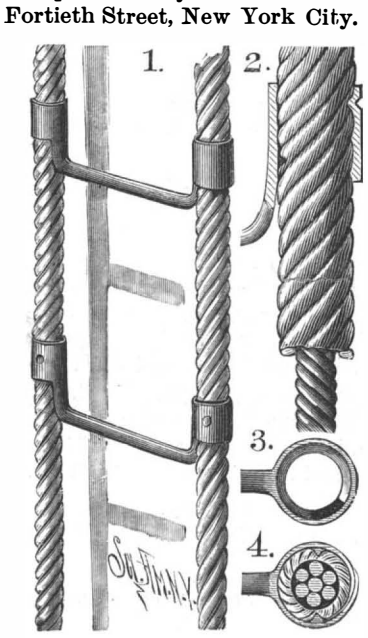


COX'S BREAD RAISER.

a firm and even foothold for the ladder upon uneven ground.

### AN IMPROVED ROPE LADDER.

A rope ladder with peculiarly constructed rungs, and ropes of metallic cable covered with fibrous strands, making an article especially adapted for fire escapes, is shown in the accompanying illustration, and has been patented by Mr. Harlow French, of No. 340 West Fortieth Street, New York City. The rungs




FRENCH'S ROPE LADDER.

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are each made of a single piece of metal, having at each end an ear adapted to inclose the rope. These ears may be formed like a split ring, having on their inner surface a spiral projection which embeds itself in the fibrous strands, as shown in Figs. 2 and 4. The ears may also be made in the shape of a fork, with projections or lugs which embed themselves in the fibrous strands when the prongs are closed around the rope. The form of the rung equalizes the strain on both ropes when carrying a weight, and their shape prevents slipping of the foot of the person ascending or descending the ladder, while permitting a firm grip with the hand. Such a rope ladder is very strong and still quite flexible, while the burning or singeing of the fibrous covering of the cables will not destroy its utility.

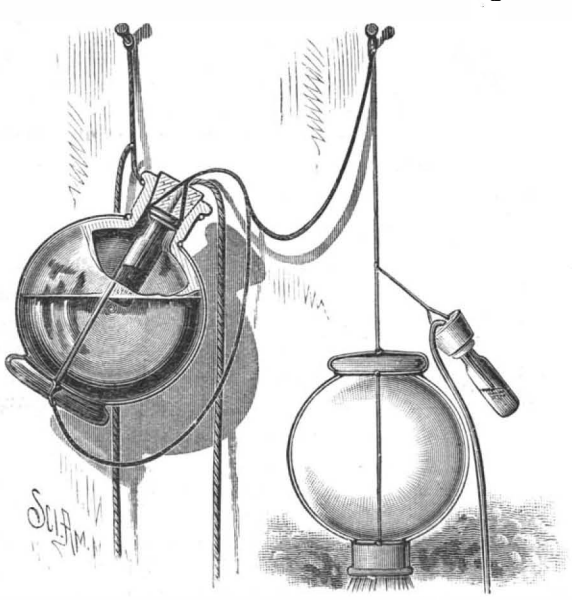
### Carbonate of Lime for Cancer.

Nearly twenty years ago Dr. Peter Hood published a communication on the value of carbonate of lime in the form of calcined oyster shells as a means of arresting the growth of cancerous tumors. In the *Lancet* for May 7, 1887, he publishes a second communication on the same subject, in which he states that although his opportunities for employing it in suitable cases have not been large, the results which he has attained through its use have been extremely satisfactory. He refers to several cases in which a persevering use of the calcined shell powder arrested the growth and pain in tumors undoubtedly of a cancerous character. Dr. Hood urges the persistent and fair trial of this remedy in cases of cancer where the nature of the affection is early recognized. It can do no possible harm, it need not interfere with other remedies for the relief of pain, its action can be referred to an intelligible and probable hypothesis, and it has been of utility in a sufficient number of cases for warranting us in reposing some confidence in its use.

An advantage of the treatment is that it may be readily prepared at home by baking oyster shells in an oven, and then scraping off the calcined white lining of the concave shell. The substance thus obtained is to be reduced to a powder, and as much as will lie on a silver quarter taken once or twice a day in a little warm water or tea.—*Therapeutic Gazette.*

### AN IMPROVED FIRE GRENADE.

A simple device for extinguishing fires at an early stage, by means of a grenade containing an extinguishing liquid, is illustrated herewith, and has been patented by Mr. Silas H. Van Houten, of Patriot, Ind. To the stopper is attached one end of a wire, the opposite end of which is secured to a fixed support, just over the spot where there may be supposed to exist special danger of a fire starting. Another wire is fastened to this one, just outside the stopper, and also attached to the flanged bottom of the bottle, which is hung up by a readily combustible cord from a nail or other support. A fuse extends through the stopper and into a small bottle within the larger one, the small bottle containing powder. A fire starting near the grenade thus suspended would quickly burn off the light cord by which it is held up, when the dropping of the grenade would cause its cork to be withdrawn and the grenade



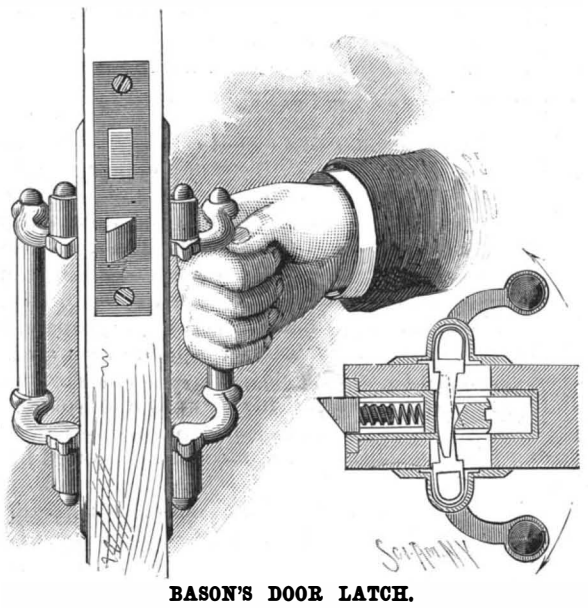
VAN HOUTEN'S FIRE GRENADE.

to be overturned, in the position shown at the right in the picture, thus discharging its contents. Should the stopper stick in the neck of the bottle, or the small supporting cord not be burned off, then the ignited fuse would explode the powder in the small interior bottle, and thus scatter the contents of the grenade. An additional cord is arranged by which the grenade may be detached from its support and inverted, if desired.

SOME queer things are seen in the Veterinary Hospital of Philadelphia. Among others are a pig's easy chair, a padded cell for a lunatic horse, a Turkish bath, and a swinging harness in which a horse may live or die without bearing any weight on his legs.

### AN IMPROVED DOOR LATCH AND HANDLE.

A door latch and handle, in which the direction of the pull required to throw the latch is the same as that needed to open the door, so that the latch is almost automatic in its working, while being cheap and simple in construction, and not liable to get out of order, is shown in the accompanying illustration, one view being of a portion of the door with the latch applied and the other a sectional plan on the line of the bolt. The invention has been patented by Mr. Thomas Bason, of Englewood, Ill. The bolt is held normally extended beyond the lock piece by a spring, and the rear walls of the central recess of the bolt are divided into sections that are inversely inclined. The handle is carried by two arms, which have projections fitting within boxes



BASON'S DOOR LATCH.

at either end, the projection of the upper arm being fitted to a lever arm working within the lock case, and these lever arms from opposite sides of the door being made to overlap just in advance of the inclined faces of the rear walls of the bolt recess. With this construction each handle may be operated irrespective of the other, and in closing the door the latch bolt works independently of the handle. Upon the projection from the lower arm of the handle there is formed a downwardly extending spur, fitting within an apertured plate fixed to a spiral spring mounted within the box. When the handles have been moved in the direction of the arrows, forcing the latch bolt back within the casing, these springs are put under tension, so that when the handles are released they will be returned to their normal position. The only strain upon the latch bolt spring is that necessary to keep the bolt projected forward, consequently this spring may be light and flexible, so that the latch will work easily. The latch may be easily fitted for any thickness of door by varying the length of the lever arm, and can be used on either right or left hand doors without alteration.

### Amyl Varnish.

This compound ether has recently come into use for manufacturing purposes without attracting any scientific attention. Its value depends on the excellent solvent power for pyroxylin which it possesses. Good soluble gun cotton will dissolve in it until a jelly is formed and the vessel may be inverted. On this account it has become valuable to the manufacturer of celluloid and to the manufacturer of certain kinds of lacquer for coating brass and copper. These two industries are consuming enormous quantities of this solvent, and the probabilities are that the use of it has not fairly commenced.

The employment of acetate of amyl, or pear oil, in the manufacture of artificial fruit essences has long been known, and for this purpose it has commanded a high price, so high indeed as to exclude the possibility of its general use as a solvent; but for the above mentioned industries it can be made commercially pure to answer the purpose as well as the highly purified and more agreeably smelling compound. Two patents have been taken out in England during the past three years bearing on this subject—one on account of its property of dissolving gun cotton, the other on a method of manufacture. In the former the inventors claimed the solution to be valuable for the making of varnishes, and that "when 200 parts nitro-cellulose are mixed with 600 parts acetate of amyl, a mass of doughy consistency is obtained, which can be used for any purpose for which celluloid is used. With the addition of castor oil, china clay, and a small proportion of certain essential oils, a compound suitable for the production of artificial leather may be produced."

Several methods of manufacture have been proposed, but the one most common in the United States consists in heating in a lead or glass retort a mixture of acetate of sodium or calcium, sulphuric acid, and fusel oil.

The ether distills at 137° C., has a specific gravity at 15° of 0·876, and is almost absolutely insoluble in water. Its solvent action is not confined to gun cotton, for it readily dissolves tannin, fixed and volatile oils, resins, and camphors, and may become a valuable solvent in pharmacy, in addition to the several uses it already possesses.—*Amer. Jour. Pharmacy.*

### Engraving with Mercury and its Salts.

It is known that when mercury is deposited on a metal, fatty lithographic ink will not "take" upon it when an inking roller is passed over it, and that the black adheres to the untouched parts of the metal. If a well polished and clean plate of zinc is taken, and a design is traced thereon with mercury, the design will appear in brilliant white upon the gray background of the zinc. After tracing the design, an intaglio plate can be obtained by plunging the plate without being coated with varnish into a bath containing 100 parts of water and two parts at least of nitric acid. The action of the acid is very rapid, and for a long time only attacks the parts touched by the mercury. When deep enough, it can be used for lithographic work. If, instead of nitric, hydrochloric acid is used, the contrary effect takes place. The unaffected zinc is strongly attacked, and the traces of the mercury give a relief plate which can be used for ordinary typographical work.

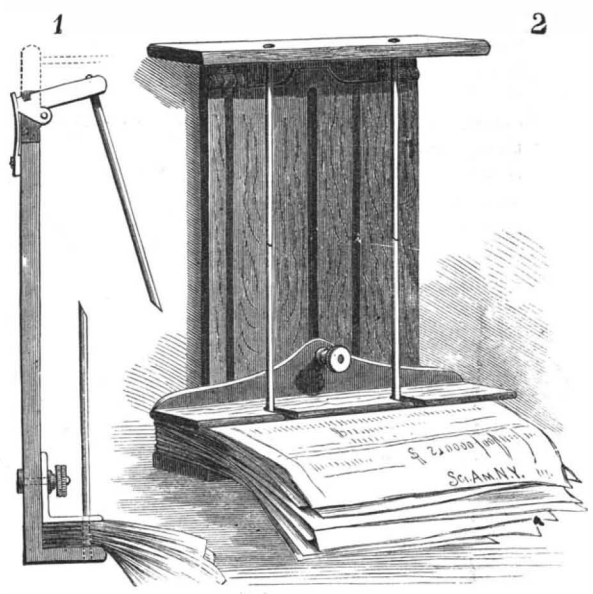
If the operator does not wish to draw upon zinc, the design can be traced upon paper with a salt of mercury. The sheet of paper being then applied for two hours to a plate of zinc, the drawing is sharply reproduced in white lines of amalgam, on the gray surface of the metal, just as if it had been traced directly.

The same result is obtained if the design is traced upon paper with a sticky substance (ink containing gum or sugar), and if it is dusted over with a mercury salt in fine powder. On dusting off the surplus and applying the sheet containing the design to a plate of metal, the same result is obtained. The same result is obtained if a newly printed proof is used, and is dusted with mercury salt while the ink is still wet and sticky. All the lines thus reproduced are chemically engraved, as has been described above. The same results are obtained by dusting with mercury salts a photographic carbon print containing a gummy substance, and the effect of half tints is even secured.

Biniodide of mercury is the salt to use.—*Memorial Industrielle.*

### AN IMPROVED LETTER AND BILL FILE.

A ready reference file for retaining letters, bills, papers, and other documents, whereby they will be securely held, and from which all or any of them may be readily removed, is shown in the accompanying illustration, and has been patented by Mr. Wm. Hanford King, of Little Silver, New Jersey. The general arrangement of the back and foot piece, the latter with its fixed vertical file wires, and of the hinged head piece, also carrying file wires or pins, will be readily understood from the illustration, Fig. 1 indicating in dotted lines the position of the head piece when it is swung up to place papers on the file. The retainer, which holds the papers snugly together on the file wires, is fitted loosely with a threaded bolt and set screw, whereby it may be readily adjusted any-




KING'S LETTER AND BILL FILE.

where along the back piece. Bills and papers filed in this way are likewise readily removed in order for binding, the binding cord being passed through the holes made by the file wires, and then tied at the back. This may be more readily effected by having the top pins hollow, or by having eyes near their points.

THE celebrated Lily of the Valley perfume is said to be made as follows:

| | |
|---|---|
| Extract of jasmine | 100·0 |
| Extract of ylang-ylang | 15·0 |
| Cardamom seeds | 5·0 |
| Oil of orris flower | 10 drops |

The cardamom odor, if predominating, must be neutralized with jasmine.

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### THE ARMAMENT OF THE ATLANTA.

The new cruiser Atlanta proved a stanch though slow sea boat on her trial trips in blue water, but some recent tests with her battery show her in imminent danger from the recoil of her own guns. While lying lately in Gardiner's Bay, Long Island, one round was fired with reduced charges and shell and one round with full charges and shell from each gun of her battery, which consists of two eight inch and two six inch breech loading rifles and four rapid firing three pounders.

As a result, both eight inch gun carriages were disabled, and the six inch carriages, as well as the three pounder rapid fire gun mounts, were proved failures, being unable to withstand the strain put upon them. Indeed, the ship herself was fairly rattled by the firing; doors were sprung from their fastenings, several deck knees were started, and while firing was in progress with one gun, the neighboring guns had to be abandoned by their crews. News of this reaching the Secretary of the Navy, the Atlanta was ordered to sea for a thorough trial, at the risk, be it said, of losing both ship and crew, which, when only begun, showed the ship wholly unable to bear the shock of recoil, and her commander put into Newport, where the Atlanta now swings to a buoy off the torpedo station.

We illustrate herewith a gun crew aboard the Atlanta working one of the eight inch rifles that have caused the havoc; the sketches having been made by our artist, who visited the Atlanta before she set out for Gardiner's Bay.

Fig. 3 represents three pounder quick firing gun, Fig. 2 the same type being pointed and fired, and Fig. 1 a six inch gun stopped in its embrasure in order to secure and steady it while at sea. During fire, the stop is cast off and the embrasure thrown wide open to allow of sighting.

The big gun shown in the engraving rests upon a carriage, or to speak more accurately a "top carriage," because this kind of gun support is composed of two distinct parts; the upper one, after firing, sliding a short distance over the under one or chassis as the liquid escapes out of the hydraulic buffers by the pressure exerted against them by the gun in recoiling. In land works, where the base on which the gun rests may be made of masonry, the rails on which the chassis rests are made to run up a sharp incline, and the recoil of the piece is nicely checked by its backward movement up hill. But on shipboard, with space limited, and the base unsteady, because of the movement of the ship in the seaway, it is immediately obvious that such a system is impracticable, first, because the sudden movement of heavy guns across the deck would threaten the stability of the ship, and again, because the guns running thus free, the lurching of the vessel might unship them and cause serious disaster. To suit the requirements of mounting and firing heavy guns aboard ship, the device portrayed in the engraving was hit upon long since by an English ordnance officer.

The top carriage, on which the gun will be seen to stand, is of wrought iron, and so is the chassis on which the top carriage moves. This top carriage is made of two cheeks joined by a like number of plates made of boiler iron, and called front and rear transoms. The cheeks are triangular in shape, separated by interposing at the edges the vertical portion of a T-shaped bar; the horizontal branches projecting, the one over the other, to form a double flange, which gives stiffness to the cheeks. The hydraulic buffer which checks the recoil is laid parallel to and between the sides of the traversing platform, and the carriage, in recoiling, forces a piston into a cylinder filled with alcohol and water, which escapes by means of perforations in the piston head.

The cylinders are, in the case of the Atlanta's guns, attached to the front end of the chassis, this position being generally supposed to be best because the more rigid, though there are said to be advantages attaching to the other position at the rear, in which case the rod is forced out of the cylinder. Besides checking the recoil in firing, the hydraulic buffers serve to force the gun in or out of the battery, and also to traverse the carriage to the right or left.

As is usual in mounting guns afloat, the engraving shows that the rails on which the chassis rests, instead of running up an incline in the rear of the piece, are laid at right angles to its alignment, only permitting the carriage to move to the right or left—an operation necessitated in lateral sighting.

As may readily be conjectured, the force exerted by the recoil of such a gun as this is enormous. Powerful apparatus is required to check it, and the base upon which this apparatus is affixed—in this case, the deck and framework of the ship—must needs be specially reenforced in order to withstand the shock of checking. When we analyze the disposition of the forces exerted and their mean direction, we find that the foundation upon which the carriage rests—to wit, the deck and its bracings—must be able to resist the shock of recoil minus the amount of tempering and easing afforded by the hydraulic apparatus. It is not necessary to the present purpose to enumerate the various formulæ by which this may be accurately determined, nor to go into a mathematical discussion, since we are not informed as to the exact amount of charge fired, resisting power of hydraulic buffers, and strength of deck structure.

It is sufficient to say that these formulæ are easily had, and it is hard to understand how the Ordnance Board of the navy, which must have studied them, could have made what seems to be so fatal an error. The reports of the effects of the firing aboard the Atlanta furnish circumstantial evidence not only that the gun carriages are too frail for the service expected of them, but that the structure of the ship herself is inadequate to the demands of the battery she is expected to carry.

Let us look for a moment at the theory of construction of a sea-going ship, fitted with a steel spur on her forefoot, and intended for ramming. It is evident that the ordinary ship, running full tilt at an enemy, and striking him with or without such a weapon, would, in all probability, carry away her own bows, and be wrecked by the force of her own blow. The projectors of this system of warfare provided against this form of structural suicide by putting all parts together end on, as one might say; that is, every timber, bolt, knee, plate, and even the engines and boilers were set with the single purpose of withstanding the shock when the ship should fetch up, all standing, against an opposing obstacle. These ships could strike an enemy while running full speed, and not start a bolt! Now, in building ships to carry modern guns, a special construction is likewise necessary. The fact must be continually kept in mind that, at various points, great shocks are to be received, and all the timbers, plates, and frames should be arranged to successfully resist them.

Eminent ordnance authorities have laid down the rule, based upon experience, that injury to the carriage resulting from the recoil of the piece increases with the square of the velocity of the recoil, which is dependent on the relation between the weight of the carriage and the weight of the piece. In every case, they say, the carriage must be so constructed as to effectually meet the forces that act upon it, as the axis of the bore intersects the axis of the trunnions. The entire force of the charge acting on the bottom of the bore is communicated to the carriage at the trunnion beds.

Looking at the Atlanta as she is, and remembering that, though a warship, she cannot fight, and though a steamer has no speed, one is reminded of those merchantmen, up to a recent period quite numerous on the ocean, having gun ports painted on their sides, and targets therein as though the broadsides were ready to run out. At a distance these dummy guns seemed to sweep the horizon with their frown, and in the old days we are told that the pirate and the corsair bore up and squared away when they sighted one of these harmless craft, fearing to draw near for a nearer view, lest they might get a broadside between wind and water to moderate their curiosity.

It seems only fair to the memory of the contractor who built the Atlanta to say that he had not anything to do with the fact, if it is a fact, that the ship is not structurally strong enough to withstand the recoil of her guns. If he put in the material agreed upon and fashioned it according to his contract, as the advisory board of naval officers testified he did, his responsibility ended there. The advisory board, and none other, is accountable for the ship, just as the ordnance board is responsible for her defective gun carriages.

### New Professor of Physics at Cornell.

Professor E. L. Nichols, of the University of Kansas, has been appointed to the chair of Physics, Cornell University, in place of Prof. Anthony, resigned. The *Ithaca Journal* says:

"Professor Nichols was graduated at Cornell University with high honors in 1875. He had already acquired an especial taste for physics, and, accordingly, immediately after receiving his degree, he went to Germany, where, during four years, he prosecuted his studies mainly in the laboratories of Helmholtz and Kirchhoff in the University of Berlin. After taking the degree of Ph.D., he returned to America, and for one year held a fellowship in Johns Hopkins University. He then had a year of experience in the further study of electrical physics in the laboratory of Edison at Menlo Park. In 1882 he entered the practical work of a professor of physics, and has been so successful in building up the department at the University of Kansas that the university, during the past winter, made a special appropriation of five thousand dollars for an electrical equipment.

"The testimony is unanimous that Professor Nichols is a brilliant experimenter and an excellent lecturer. While he is a very industrious worker in the laboratory, he has good social qualities, as well as the invaluable characteristic of ambition and good health. During the past five years he has published numerous papers read before the American Association, and may confidently be relied upon to keep the work of the laboratory here prominently before the scientific world."

## Correspondence.

### How Snakes Climb Trees—Remarkable Growth of a Girdled Tree.

*To the Editor of the Scientific American:*

In your issue of May 14, in an article on "Boys and Trades," you say, "How many know how a snake can climb a tree?" I am one of those that do not, and yet I have seen it done once, very similar to the one your correspondent saw, as given in the article, "How snakes climb trees," July 2, and yet it does not tell how it is done, by what process the snake holds and yet climbs, so that you could not fairly answer the question.

Some years since, I saw a black snake, about 5 ft. long, lying under a large cherry tree. The limbs of the tree projected nearly horizontal, and the nearest was 12 ft. or more from the ground. Between me and the body of the tree, but not quite in a direct line with the snake, was a slender cedar tree, whose top was about 4 ft. below the nearest branch, and about 10 ft. from the body of the tree. The snake lay on the opposite side of the tree. As there were plenty of stones there, I thought I could easily kill the snake, and threw one at it, but did not hit it. In an instant it came, as I thought, directly for me, but it was for the cedar tree. It went straight up it, until it stood in a straight line above the top (and the top of a young cedar is very slender, about like a whip), with only a few inches of its tail resting against the slender top of the cedar (it was a sight I never shall forget), then its head was just up to the first limb of the cherry tree. It gave a slight curve motion and immediately it continued to ascend, with only about two inches of its body in contact with the limb, so it passed up several limbs, nearly standing on the tip of its tail to reach the next limb, until about 25 ft. from the ground, when it lay along the limb, and put its head over and looked at me, as though it would say, "What are you going to do about it?" I did not throw any more stones. I was surprised. I thought that a snake had to coil around a tree to climb it, and as the snake looked as though it might spring upon me, I left, wondering by what power a snake could climb a tree like that, and how it could calculate that he could reach the tree, when the top of the cedar was so far below.

In the SCIENTIFIC AMERICAN for October 16, 1886, is an article entitled "Remarkable Tree Growth after Girdling." It is singular that, in the August previous, I had a large whitewood or tulip tree, which I suppose is the same as "poplar" in the article referred to, and as it was very tall and shaded the ground, and could not be cut down on account of the crops, I girdled it about 3 ft. above the ground, by cutting away all the bark for about 4 in., and also cutting out the wood all around, that no sap wood might remain, expecting to see it soon wither and die, as the weather was hot and dry at the time. But it continued green and the leaves did not turn or fall off in the fall sooner than other trees. I then saw your article in the October number, and left the tree to see what it would do. It put out leaves, was full of blossoms, and made as much growth as though the bark had not been taken off. The wood now is black and rotten for the depth of three-fourths of an inch, and the bark is dead about 8 in. below the cut, but above the bark is alive to within one-half an inch of the cut. The wood has decayed so much that a growth of fungus is around it in places, like toadstools. The tree is 68 in. in circumference at the cut, and between 80 and 100 ft. high, and is now as thrifty as any of its kind, therefore it is not fed by the sap going between the bark and the wood.

J. E. PARKER.

Morristown, N. J.

### Progress in Florida.

A correspondent writing from De Land, Florida, says: Our city council have contracted for water supply for fire protection, and an artesian well for the purpose is down 325 ft., and will go about 200 more to get a good flow. Arrangements are about completed for lighting the streets and stores by electricity, and work will begin in September.

We have good railroad connection; four daily mails; telegraph and express companies, thirty-one; four large hotels, fine schools, college, public, private, and kindergarten, churches of all denominations. No malaria, high and dry, good breeze day and night, thermometer averaging 90° in the shade at noon, cool nights.

An ice factory furnishes good ice at your door for one cent per pound, seventy-five cents per hundred pounds, and makes five tons a day.

JAS. H. STACKHOUSE.

De Land, Fla.

### Gas Liquor for Grass.

It has been employed at Brackley, in Northamptonshire, on grass and other lands for the last two years, with very good results. There is now on the land where the liquor was applied about the heaviest crop of grass to be seen in the neighborhood.

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## ELECTRIC LIGHT ENGINES AT THE MANCHESTER EXHIBITION.

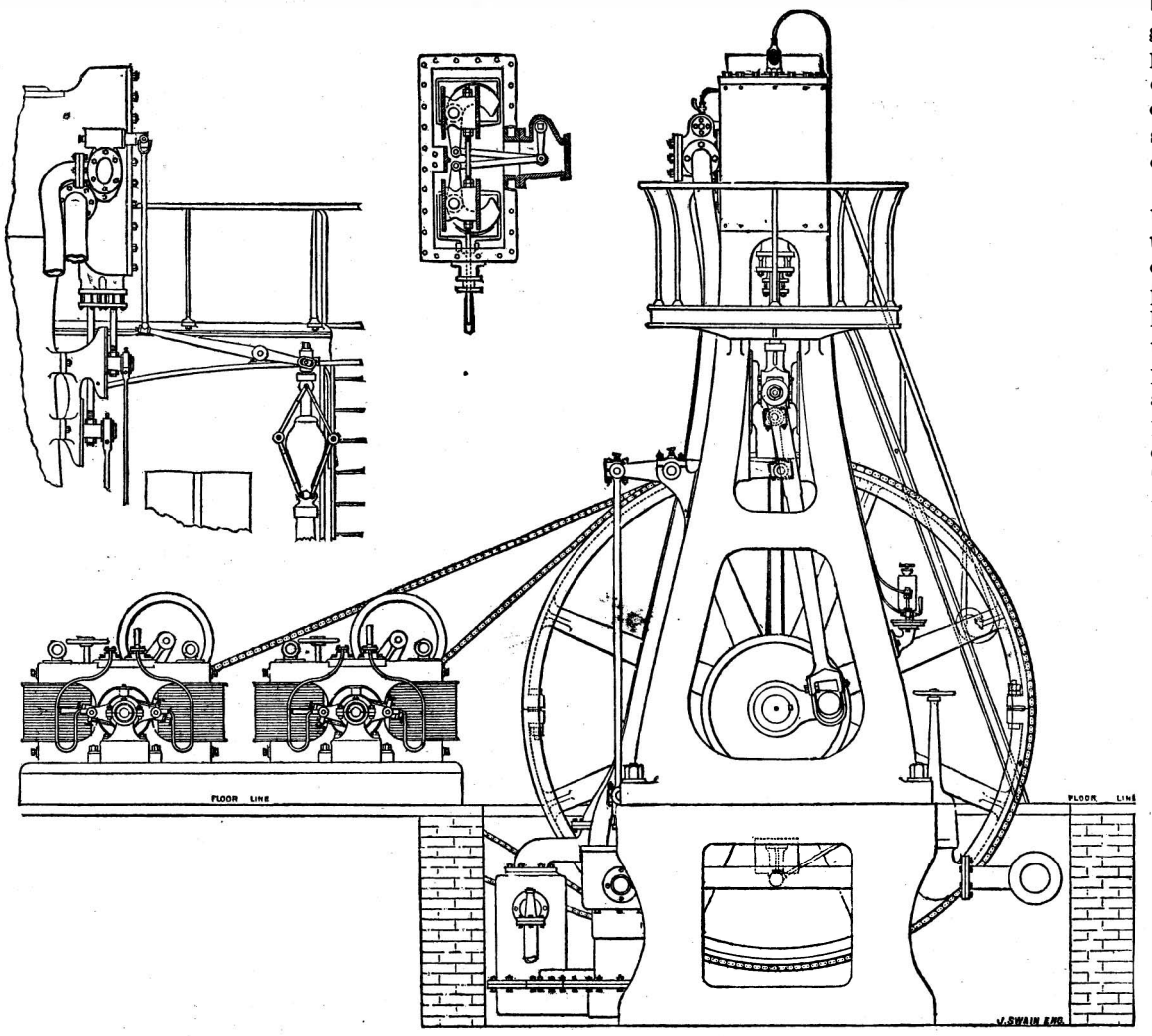
The portion of the electric lighting department adjoining the machinery in motion section has been reserved for the electrical plant for lighting the Fine Art galleries, fourteen in number, which are situated on the north side of the eastern nave. Both engines and dynamos have been constructed by Messrs. Mather & Platt, of the Salford Iron Works, Manchester. The engines have been specially designed for electric lighting work, and embody several interesting and novel features. In their general arrangement, and in the method of driving, Messrs. Mather & Platt have specially held in view the requirements of a central station installation or a large mill installation, where economy of floor space is usually of primary importance. When the engines are worked to their full power, and the dynamos replaced by the next standard larger size, the whole plant would be capable of supplying current for 4,000 lamps of 16 candle power, while the total floor space occupied does not exceed 30 feet by 20 feet. Another essential condition of electric lighting engines is a sensitive, quick-acting, automatic cut-off. This is accomplished by an entirely new form of cut-off valve, recently patented by Messrs. Mather & Holgate, and described below.

The engines are of the vertical high pressure condensing type, with a single inverted cylinder, 20 in. diameter and 30 in. stroke, intended to run at 120 revolutions per minute, and to work with a boiler pressure of 100 lb., and under these conditions will each indicate about 200 horse power. The two engines are entirely independent, each having a separate fly wheel and independent outer bearings, but they are connected together by a bridge to give access to the cylinders and valves. The cylinders, cylinder slides, and crank bearing pedestal are cast in one piece with the trunk or frame, which is of a box section, closed entirely back and front, but open at the sides. The form is very rigid, and looks massive and substantial in design; at the same time, as the frame casting is only seven-eighths inch thick, it is actually not so heavy as it appears. The cylinder is fitted with a liner, which forms the steam jacket. The valve box is bolted on separately, and has double slide valves, so as to get straight ports from the valve box to the cylinder. In the main slide valves the ports are straight on the cylinder side, but the passages are obliquely directed within the block of the valve, so that the ports on the off side are curved, the edges being circular. The main valves are worked in the usual way with an eccentric on the crank shaft. The cut-off valves work on the back of the main valves, with a reciprocating motion, also derived from an eccentric on the crank shaft.

These valves have curved edges corresponding to the curvature of the ports of the main valves, and are carried on pivots fixed in the slide block. The cut-off valves can thus turn about an axis at right angles to the axis of the cylinder, in addition to their rectilinear reciprocating motion. The point of the stroke at which the steam is cut off depends upon the angular position of the cut-off valve, which is regulated directly by the governor through a suitable series of levers. This form of cut-off has given exceedingly good results on smaller engines. Applied to an ordinary horizontal engine indicating 20 horse power, it was found that when 50 per cent of the whole load was suddenly thrown off, the momentary variation in speed did not exceed 4 per cent, which was immediately reduced to 1¼ per cent, and that with the whole load suddenly thrown off the rise in speed was 2½ per cent only.

The piston rod and crank pin are steel, and the connecting rod best hammered scrap. At the crosshead end the connecting rod is forked, and the wear taken up by a wedge and screw. Its length is three times the stroke. The crank is of steel, and balanced and covered with a cast iron shield. It is shrunk and keyed on to the shaft. The crank pin is also shrunk in. The shaft is 8 in. diameter, bossed up to 8½ in. for the fly wheel, and at the crank end is carried in a bearing 15 in. long, and at the off end in an angle pedestal 12 in. long and 6½ in. diameter. The main bearing is adjustable both top and bottom, and at the sides by wedges and screws, so that the brasses can be fixed in any way while the engine is at work. The fly wheel is 12 ft. diameter and 30 in. wide, and is prepared for two 13 in. belts. It was cast whole, split, and bolted together at the rim, and held with bolts and shrunk hoops at the boss. Its finished weight is 5¾ tons.

All the bearings, the eccentrics, crank pins, etc., are lubricated from one oil tank, to which the oil is pumped from a tank at a lower level, into which it collects from the drippers. The cylinder is lubricated by Mather & Platt's improved sight feed lubricator, requiring one plug valve only. The air pump and condenser are of the ordinary vertical type, fixed below the floor. The pump is single-acting, 12 in. diameter and 15 in. stroke, and is worked by a beam from the engine crosshead. Throughout all, the threads on the bolts are of fine pitch, or gas threads, and in working parts have a nut of ordinary depth, locked with a thin one, and in addition have a split cotter through the end of the bolt.

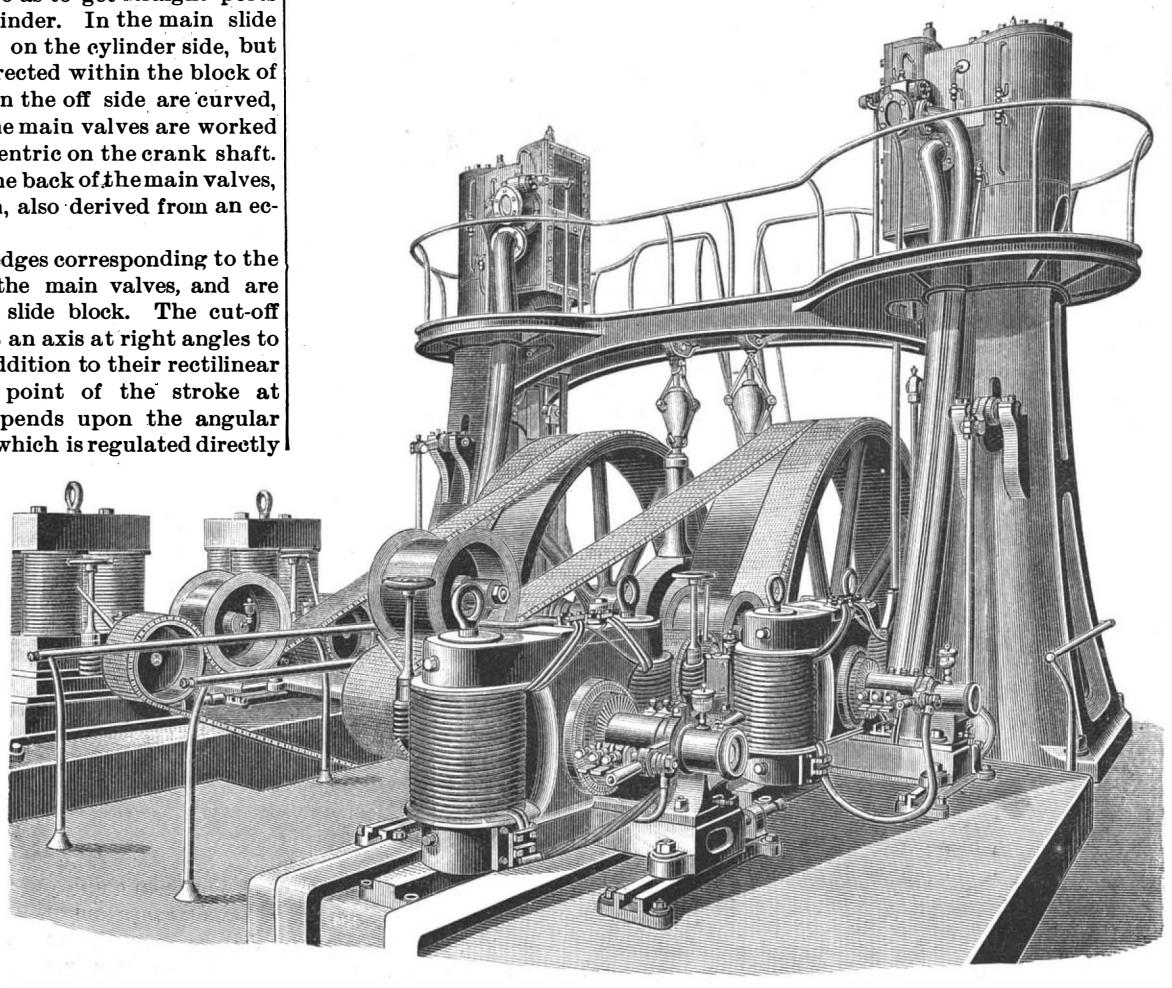



ELECTRIC LIGHT ENGINES AT THE MANCHESTER EXHIBITION

The left hand engine drives two Edison-Hopkinson dynamos, both shunt wound for an output of 105 volts, 320 amperes, at a speed of 750 revolutions per minute, equivalent to 500 lamps of 16 candle power. These machines have a commercial efficiency of 93·3 per cent, and an electrical efficiency of over 95 per cent. The improvement made in these dynamos by Dr. John Hopkinson and Messrs. Mather & Platt since the original Edison type is effectively shown by comparing the two smaller Edison-Hopkinson dynamos with the four Edison dynamos of the type which are at work close by. Although only about one-third the weight of the Edison dynamos, the Edison-Hopkinson dynamos give a larger output and have a higher efficiency.

The right hand engine drives two "Manchester" dynamos, compound wound, for an output of 100 volts, 400 amperes, at a speed of 750 revolutions per minute, equivalent to 700 incandescent lamps of 16 candle power.

The efficiency of the Manchester dynamo is also very high. With the full load the electrical efficiency is 94·8 per cent, and the commercial efficiency 92·8 per cent. These dynamos, as also the Edison-Hopkinson, are driven direct from the fly wheels of the engines with link belts, as shown by the accompanying engraving. In order to increase the lap of the belt on the driving pulley of the dynamo, it is bent on the slack side under a loose pulley riding on a stud carried on an arm projecting from the dynamo bed. This system of using a jockey pulley instead of a large belt is very effective when it is desirable to economize floor space. It was introduced by Messrs. Mather & Platt some years ago for dynamo driving, and has given good results. Careful experiments show that there is very little friction in the arrangement and no undue wear of the belt. The belts employed for driving the dynamo are worthy of notice, as instead of having flat faces, as is usual with link belts, the section is double concave, so that the pins are not bent as the belt is bent over the convex surface of the pulleys.
—*The Engineer.*



ELECTRIC LIGHT ENGINES AT THE MANCHESTER EXHIBITION.

### Artificial Clouds.

An exchange says that artificial clouds were recently created for the protection of vines from frost at Pagny, on the Franco-German frontier. Liquid tar was ignited in tin boxes and pieces of solid tar on the ground near the vines. Large clouds of smoke arose and protected the vines for two hours. Although vines in the neighborhood were injured by the frost, all that remained under the clouds were left uninjured. Of course such a procedure can succeed only in calm weather; but it is in calm weather only that white frosts occur.

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### A MALAISIAN SPIDER.

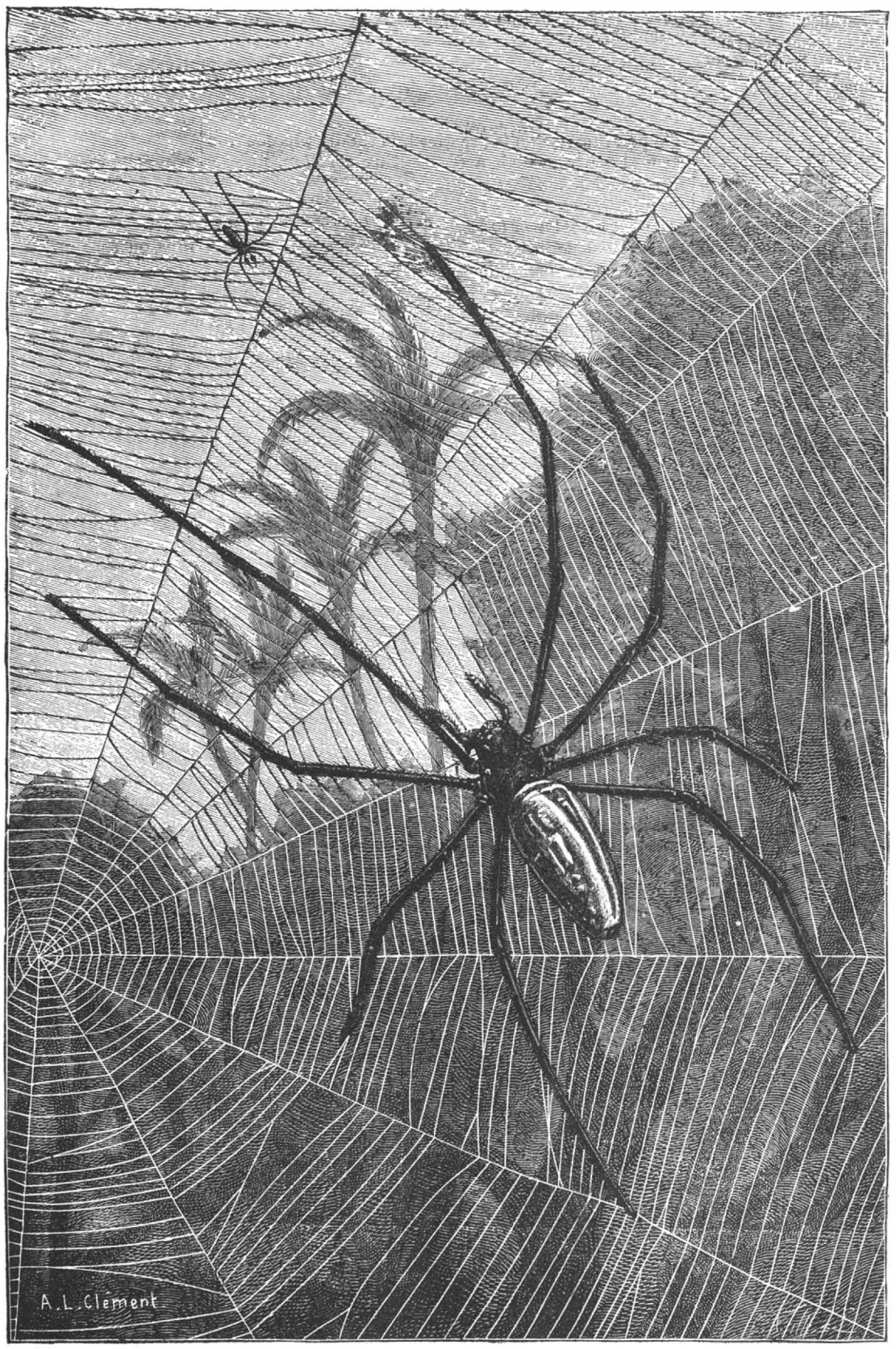
Like our Epeiras, the Nephilas of the Indian Archipelago construct their aerial nets at about five and a half feet above ground, and often at a greater height, and so that the interior can always be seen. In nowise afraid of being seen, the great spider walks calmly around on her long legs, which give her the appearance of an inhabitant of Landes mounted upon his stilts. She will run over your face, your arms, and your shoulders, and quietly descend along your body to the nearest leaf, and make no haste to disappear. There is nothing in these large spiders to remind us of the abrupt movements of our easily scared species. They seem to be conscious of their strength, and it may be suspected that they have few enemies. On the contrary, the entire winged and turbulent host of aerial insects pays them a large tribute. The heavy scarabæus, as well as the spring grasshopper, is arrested by the strong web, the wings of the butterfly become entangled therein, and the buzzing fly, despite its murmurs, is made a prisoner by it.

I made the acquaintance of the Nephilas ten years or more ago, to the north of Java, at Djockalan, a district now ravaged by the eruption of Krakatoa, says Mr. Maindron. These beautiful spiders were not rare in the great virgin forest, and their immense webs occupied spaces of several yards. These webs were composed of strong and elastic threads, and were so firm that my cork helmet, my *salacko*, easily remained suspended within. The male, as may be seen from the engraving, is a pygmy alongside of the female, and the latter, an incarnation of the myth of Semiramis, only too often devours her spouse. After she has laid her eggs, she envelops them in a silken cocoon, the first cradle of her progeniture.

In the Moluccas, in New Guinea, at Salwathy, as well as at Andaie, I again came across the Nephilas, and more than one of them even stretched its web between the bamboos extending above the roof of our rustic dwelling near the harbor of Dorey. But these spiders, being eminently sylvan and rural in their habits, never enter houses, and rarely even take up their abode in the vicinity of them. Their favorite places are clearings in the thickets of the virgin forest, and they leave the care of hunting insects in the dwellings of man to the squat bellied Agricopa and mouse colored Phyllodroma. This last named spider, which, with legs extended, is certainly larger than my hand, passed the day squatting in my mosquito net, where I left it in all tranquillity to hunt mosquitoes. During the night I many times felt it pass over my leg or face, but the least motion caused it to disappear. This companion of my nights never left my mosquito net except in the evening, when insects were flitting around the light. Suddenly, if some moth or grasshopper stopped upon the table, the fall of a heavy body from the ceiling was heard, and the spider disappeared with his prey. One evening, even, Mr. Raffray having driven it away, it returned a moment afterward to look among the cards of our piquet party for the grasshopper that it had been obliged to abandon.

The genus *Nephila*, which was proposed by Leach in 1817, differs especially from the genus *Epeira* in the buccal pieces (maxillary plates and labial piece), which are much longer than wide. In the male, the tibia of the jaw limb does not cover the bulb, the latter being simple and globular, but prolonged by a long coronate stylet. One European species, *E. fasciata*, has been referred to this genus, but erroneously, as the form belongs to the genus *Argiope*.

The number of known species of the genus *Nephila* is about fifty, distributed as follows: Africa and Madagascar, 20; Southern Asia and Malaisia, 7; Oceanica, 19; America, 4. It will be seen, then, that these spiders are confined to the tropics, with the exception of *N. clarata*, Koch, of Japan, and *N. plumipes*, Koch, of the Southern United States, and a few Australian forms. The best known species are *N. femoralis*, Lucas, of the west coast of Africa, *N. inaurata*, Walk., of Madagascar, *N. maculata*, Fabr., of Malaisia and India, *N. antipodiana*, Walk., of Malaisia and Indo-China, *N. clarata*, Koch, of China and Japan, *N. claripes*, Linn., of the Antilles, *N. Durvillea*, Walk., of Polynesia, *N. edulis*, Labill., of New Caledonia, and *N. fasciculata*, Degeer, of South America. The specimen figured herewith is *N. chrysogaster*.—*La Nature*.




A MALAISIAN SPIDER. (MALE AND FEMALE; NATURAL SIZE.)

### Electrical Ice Cream Poison.

Dr. George S. Hull, of Chambersburg, Pa., advances the theory that ice cream poisoning is due to chemical action which takes place in the ice cream freezer, and which dissolves the zinc. He demonstrated his theory by means of a galvanometer.

In conducting the experiments, the doctor connected the zinc, paddle, and tin can by means of a copper wire with a moderately sensitive galvanometer introduced in the circuit. He first experimented with pure cream, which deflected the galvanometer seven degrees at freezing point, thus showing that some slight solution was taking place, and proving that if pure cream caused a deflection of seven degrees, the other ingredients of ice cream would probably cause more, and in such case sufficient zinc would be dissolved in the ice cream as ordinarily made as would make it decidedly dangerous as a delicacy. The deflections caused by various other substances used were: Half cream and milk 25 degrees, pure milk 45 degrees, one-half cream, half milk, sugar and vanilla flavor 58, the same mixture with corn starch 44, the same mixture with eggs 80.

### Poisonous Toadstools.

*Science pour Tous* observes that no certain method exists for distinguishing poisonous from edible toadstools, but that it is possible by a very simple means to remove from the poisonous ones their active principle.

This process, made known a long time ago, but brought to light again a few years since by Mr. Fred. Gerard, is based upon the fact that the poisonous principle of these fungi is soluble in saline or acidulated water. This granted, the operation is as follows.

The toadstools are quartered, if of medium dimensions, or are cut into eight pieces if large. One pound of them is put into a quart of water to which has been added a spoonful of good, strong vinegar or two spoonfuls of table salt. They are allowed to macerate in this liquid for one or two hours, and are then washed with an abundance of water and put into a vessel of cold water, which is to be placed over a fire. After a quarter of an hour's or half an hour's boiling, the fungi will have lost their noxious principle. They are again washed, and will then be fit for preparation for the table, without any danger.

Experience has perfectly demonstrated the safety of this method. Mr. Fred. Gerard and his family, before a committee of three members of the Health Board of Paris, partook of a repast of fungi, among which was the poisonous "fly agaric" (*Agaricus muscarius* and *Agaricus bulbosus*). No one was incommoded. The best advice to give to those who cannot distinguish between poisonous and edible fungi is to steer entirely clear of this sort of food. Granting the efficiency of the above method of rendering toadstools innocuous, there is a certain delicate and peculiar flavor in the edible species that would be lost in the manipulation here suggested, and it certainly would not render poisonous kinds desirable food, even after their venom had been removed.

### Illuminating Streets by "Smoke."

When William Murdoch made his discovery of combustible air, or gas, even great and wise men laughed at the idea. "How could there be light without a wick?" said a member of Parliament, when the subject was brought before the House. Sir Humphry Davy ridiculed the idea of lighting the town with gas, and asked one of the proprietors if he meant to take the dome of St. Paul's for a gas meter. Sir Walter Scott made himself very merry over illuminating London "by smoke," though he was glad enough, not long afterward, to make his own house at Abbotsford light and cheerful on wintry nights by the use of that very smoke. When the House of Commons was lighted by gas, the architect imagined that the gas, ran on fire through the pipes, and therefore insisted on their being placed several inches from the wall for fear of the building taking fire. The members might be observed carefully touching the pipes with their gloved hands, and wondering why they did not feel warm. The first shop lighted in London by this new method was Mr. Ackerman's, in the Strand, 1840; and one lady of rank was so delighted with the brilliancy of the gas lamp on the counter that she asked to be allowed to take it home in her carriage.—*Invention*.

In a note to the *Photographische Mittheilungen*, E. Vogel, Jr., states as the result of experiments made by him that he finds when isochromatic plates have been prepared by immersing ordinary plates in a bath of azalin they lose their sensitiveness to some extent, but by subsequently immersing them in a two per cent solution of ammonia their sensitiveness is quite restored.

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### Disinfection and Disinfectants.

(*Continued from page* 69.)

Boiling for half an hour will destroy the vitality of all known disease germs, and there is no better way of disinfecting clothing or bedding which can be washed than to put it through the ordinary operations of the laundry. No delay should occur, however, between the time of removing soiled clothing from the person or bed of the sick and its immersion in boiling water or in one of the following solutions; and no article should be permitted to leave the infected room until treated with standard solution No. 3.

*Dissolve four ounces of corrosive sublimate and one pound of sulphate of copper in a gallon of water.*

Two fluid ounces of this standard solution to the gallon of water will make a suitable solution for the disinfection of clothing. The articles to be disinfected must be thoroughly soaked with the disinfecting solution and left in it for at least two hours, after which they may be wrung out and sent to the wash.

[N. B.—*Solutions of corrosive sublimate should not be placed in metal receptacles,* for the salt is decomposed and the mercury precipitated by contact with copper, lead, or tin. A wooden tub or earthen crock is a suitable receptacle for such solutions.]

When diluted as directed, this solution may be used without danger from poisoning through the medium of clothing immersed in it or by absorption through the hands in washing. A poisonous dose could scarcely be swallowed by mistake, owing to the metallic taste of the solution and the considerable quantity which would be required to produce a fatal effect.

Clothing may also be disinfected by immersing it for four hours in a two per cent solution of carbolic acid.

Clothing or bedding which cannot be washed or subjected to the action of steam may be disinfected by exposure to dry heat in a properly constructed disinfecting chamber for three or four hours. A temperature of 230° Fah. should be maintained during this time, and the clothing must be freely exposed, *i. e.*, not folded or arranged in piles or bundles, for the penetrating power of dry heat is very slight.*

The temperature above mentioned will not destroy the *spores* of bacilli, *e. g.*, of the *Anthrax bacillus*, but is effective for the destruction of all disease germs which do not form spores; and there is good reason to believe that this list includes smallpox, cholera, yellow fever, diphtheria, erysipelas, puerperal fever, and scarlet fever (?) Moist heat is far more effective, and it is demonstrated that ten minutes' exposure to steam at a temperature of 230° Fah. will destroy all disease germs, including the most [illegible] spores.

In the absence of a suitable chamber for the use of dry heat, fumigation with sulphurous acid gas may be resorted to. The room in which disinfection is practiced should be hermetically closed to prevent the escape of the gas, and three pounds of sulphur should be burned in it for every 1,000 cubic feet of air space. Expose the articles to be disinfected as freely as possible by hanging them up in the disinfecting chamber, and leave them at least twelve hours subjected to the action of the sulphurous acid gas.

Soiled mattresses, pillows, feather beds, and other articles of this nature cannot be effectually disinfected by sulphur fumigation, owing to the fact that the gas does not penetrate to their interior in sufficient amount. For articles of this kind, and in general for articles of little value, which have been soiled by the discharges of the sick, destruction by fire will be advisable.

*Disinfection of the Sick Room.*—In the sick room no disinfectant can take the place of free ventilation and cleanliness. It is an axiom in sanitary science that *it is impracticable to disinfect an occupied apartment,* for the reason that disease germs are not destroyed by the presence in the atmosphere of any known disinfectant in respirable quantity. Bad odors may be neutralized, but this does not constitute disinfection in the sense in which the term is here used. These bad odors are, for the most part, an indication of want of cleanliness or of proper ventilation; and it is better to turn contaminated air out of the window, or up the chimney, than to attempt to purify it by the use of volatile chemical agents, such as carbolic acid, chlorine, etc., which are all more or less offensive to the sick, and are useless so far as disinfection—properly so called—is concerned.

*When an apartment which has been occupied by a person sick with an infectious disease is vacated, it should be disinfected.*

The object of disinfection in a sick room is, mainly, the destruction of infectious material attached to surfaces, or deposited as dust upon window ledges, in crevices, etc. If the room has been properly cleansed and ventilated while still occupied by the sick person, and especially if it was stripped of carpets and unnecessary furniture at the outset of his attack, the difficulties of disinfection will be greatly reduced.

All surfaces should be thoroughly washed with *standard solution No.* 1, diluted with three parts of water, or with 1 : 1,000 solution of corrosive sublimate.

* The limitations with reference to the use of dry heat as a disinfectant are stated in the paper on dry heat.

*Standard solution No.* 3, diluted in the proportion of four ounces to the gallon of water, may be used.

The walls and ceiling, if plastered, should be brushed over with one of these solutions and subsequently washed over with a lime wash.

Especial care must be taken to wash away all dust from window ledges and other places where it may have been settled, and to thoroughly cleanse crevices and out-of-the-way places. After this application of the disinfecting solution, and an interval of twenty-four hours or longer for free ventilation, the floors and woodwork should be well scrubbed with soap and hot water, and this should be followed by a second more prolonged exposure to fresh air, admitted through open doors and windows.

As an additional precaution, fumigation with sulphurous acid gas is to be recommended, especially for rooms which have been occupied by patients with smallpox, scarlet fever, diphtheria, typhus fever, and yellow fever. But fumigation with sulphurous acid gas alone, as commonly practiced, cannot be relied upon for disinfection of the sick room and its contents, including bedding, furniture, infected clothing, etc., as is popularly believed.

When fumigation is practiced, it should precede the general washing with a disinfecting solution, heretofore recommended.

*To insure any results of value, it will be necessary to close the apartment to be disinfected as completely as possible, by stopping all apertures through which the gas might escape, and to burn not less than three pounds of sulphur for each thousand cubic feet of air space in the room.* To secure complete combustion of the sulphur, it should be placed in powder or in small fragments in a shallow iron pan, which should be set upon a couple of bricks in a tub partly filled with water, to guard against fire. The sulphur should be thoroughly moistened with alcohol before igniting it.

*Disinfection of Privy Vaults, Cesspools, etc.*—When the excreta (not previously disinfected) of patients with cholera or typhoid fever have been thrown into a privy vault this is infected, and disinfection should be resorted to as soon as the fact is discovered, or whenever there is reasonable suspicion that such is the case. It will be advisable to take the same precautions with reference to privy vaults into which the excreta of yellow fever patients have been thrown, although we do not definitely know that this is infectious material.

The most trustworthy agent for this purpose is corrosive sublimate.

The amount used must be proportioned to the amount of material to be disinfected.

*Use one pound of corrosive sublimate for every five hundred pounds (estimated) of fecal matter contained in the vault.*

*Solution No.* 3, diluted with three quarts of water, may be used. The diluted solution should be applied in the proportion of one gallon to every four gallons (estimated) of the contents of the vault.

All exposed portions of the vault, and the woodwork above it, should be thoroughly washed down with the disinfecting solution.

To keep a privy vault disinfected during the progress of an epidemic, sprinkle chloride of lime freely over the surface of its contents daily. Or if the odor of chlorine is objectionable, apply daily four or five gallons of *standard solution No.* 2, which should be made up by the barrel, and kept in a convenient location, for this purpose.

*Disinfection of Ingesta.*—It is well established that cholera and typhoid fever are very frequently, and perhaps usually, transmitted through the medium of infected water or articles of food, and especially milk. Fortunately we have a simple means at hand for disinfecting such infected fluids. This consists in the application of heat. *The boiling temperature maintained for half an hour kills all known disease germs.* So far as the germs of cholera, yellow fever, and diphtheria are concerned, there is good reason to believe that a temperature considerably below the boiling point of water will destroy them. But in order to keep on the safe side, it is best not to trust anything short of the boiling point (212° Fah.) when the object is to disinfect food or drink which is open to the suspicion of containing the germs of any infectious disease.

During the prevalence of an epidemic of cholera it is well to boil all water for drinking purposes. After boiling, the water may be filtered, if necessary, to remove sediment, and then cooled with *pure* ice if desired.

### The Smell of Paper Money.

In speaking of a recent defalcation at the Troy post office, a gentleman said: "It is never safe to inclose an old bill in an envelope to be sent by mail. Why," said he, "men who are experts can tell whether a letter contains money or not simply by the sense of smell. If you will notice an old greenback, it has a peculiar smell about it that can readily be perceived, even if it be inclosed within a letter. It is better to send a registered letter or a postal note, or, if you inclose a bill, be sure it is a new one. That will not smell."—*Albany Journal.*

### The Chemical Composition of Man.

From a chemical point of view, man is composed of thirteen elements, of which five are gases and eight are solids. If we consider the chemical composition of a man of the average weight of 154 pounds, we will find that he is composed in large part of *oxygen*, which is in a state of extreme compression. In fact, a man weighing 154 pounds contains ninety-seven pounds of oxygen, the volume of which, at ordinary temperature, would exceed 980 cubic feet. The *hydrogen* is much less in quantity, there being less than fifteen pounds, but which, in a free state, would occupy a volume of 2,800 cubic feet. The three other gases are *nitrogen*, nearly four pounds; *chlorine*, about twenty-six ounces; and *flourine*, three and a quarter ounces. Of the solids, *carbon* stands at the head of the metalloids, there being forty-eight pounds. Next comes *phosphorus*, twenty-six ounces, and *sulphur*, three and a quarter ounces. The most abundant metal is *calcium*, more than three pounds; next *potassium*, two and a half ounces; *sodium*, two and a quarter ounces; and lastly, *iron*, one and a quarter ounces. It is needless to say that the various combinations made by these thirteen elements are almost innumerable.—*Le Practicien.*

### The Effect of the Sun's Rays on Selenium.

At a recent meeting of the Swedish Royal Academy of Sciences, Prof. E. Edlund, the celebrated Swedish electrical *savant*, read a paper on the effect of the sun's rays on selenium, describing the most recent experiments made with that substance on this point, particularly in Sweden, of which the following is a *resume:*

Some twelve years ago it was announced to this society that the metal selenium, discovered by Prof. Berzelius, had a greater electrical conductivity when exposed to the rays of the sun than in a dark chamber. This applies to the crystalline form of selenium, whereas in the amorphous state it is a bad conductor of electricity. This remarkable peculiarity of selenium has, since, many times been the subject of research in several countries, and particularly among Swedish *savants*, the results of which are that it has been discovered that the effect of the light varies under different kinds of light, and that it is, moreover, so powerful that the electrical resistance under favorable conditions, in bright sunshine, is not more than six or seven per cent of its magnitude when the metal is in a dark chamber. During the last few years these researches have been resumed by electrical *savants*, who have succeeded in demonstrating some other important electrical peculiarities possessed by this metal.

The selenium is melted on a metal disk, with which it can form some chemical combinations, and is distributed in a layer, the thickness of which is only two or three hundredths of a millimeter. On this layer of selenium a gold leaf is pressed, so thin in texture that the sun's rays can penetrate it and reach the layer of selenium. Now, if this composition be exposed to the influence of the sun's rays, and its electrical resistance be tested by leading an electrical current from the gold leaf to the metal disk below, it will be found that sometimes the conductivity will decrease to one-third per cent of what it is when the element is placed in the dark. By this method the sensitiveness of selenium to the light has been found twenty times greater than was formerly known to be the case. Moreover, it has been demonstrated by these researches that the resistance of the selenium depends upon the direction of the electrical current, the resistance being fifteen to twenty times greater if the current runs from the gold leaf to the metal disk than *vice versa.* This phenomenon, which was demonstrated in a dark chamber, seems to indicate that the chief obstacle to the continuity of the current must be sought in the point of transmission between the gold leaf and the selenium layer, or between that of the latter and the metal disk, as any difference in the resistance offered by the selenium itself, whether the current runs in one or the other direction, is impossible. This view is also supported by the circumstance that the resistance was dependent upon the strength of the current as well as upon the electromotive force of the battery.

Another discovery, also of interest and importance, was made. If the gold leaf and the metal disk, between which the selenium layer is placed, were connected by means of a wire attached to a galvanometer, it showed that the electric current began to circulate as soon as the gold leaf came under the influence of the sun's rays, and that even the beam of the moon on the light of a lamp made the element active. This being a fact, we may ask whether the light at the points of contact between the selenium layer and the metals with which the latter is surrounded effects some chemical change, whereby the formation of a current is caused, or whether the active force possessed by the light is immediately transformed into an electric current? As the current commences at the moment the element is subjected to the light and ceases the moment the latter is removed, the last mentioned solution seems really the most natural. This being as it may, we have by these experiments obtained a dry pile, a pile without acids, which may lead to the discovery of other secrets

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### IMPROVED ICE MAKING MACHINERY.

Conveniently located under one of the arches of the Brooklyn Bridge is a working example of the Pontifex ice machine, which is being successfully manufactured by the Continental Iron Works, and is thus described by *Engineering:*

The principle applied is the property of liquid anhydrous ammonia to boil at a temperature of 30° below zero Fah., at atmospheric pressure, and to take up during the process an immense amount of heat from its surroundings. The absorbing power which water has for ammoniacal gas is taken advantage of, and the aqua ammonia thus formed is subjected to distillation, which drives off the ammoniacal gas which it holds in solution, and this by a pipe surface condenser is cooled with a view, aided by its own pressure, of hastening liquefaction.

The liquid ammonia is now allowed to expand into gas by releasing it from pressure, thus producing refrigeration. It is claimed that this system produces a perfectly anhydrous ammonia gas and liquid free from all traces of steam and water.

Referring, then, to the sectional drawing, and beginning with the generator, it will be seen that it consists of a horizontal cylinder, which is filled two-thirds full of aqua ammonia containing about 30 per cent by weight of ammonia gas in solution. This gas is driven off from the water by means of a steam coil (the steam being condensed in the coil and discharged by the steam trap), the gas passing upward through the analyzer, which contains a series of perforated trays that serve the purpose of holding back all traces of steam that may be carried along with the gas. The gas then passes into the upper coils of the condenser, where, under the combined influence of its own pressure and of the condensing water around the coils (which enters the condenser at the bottom), it is cooled and liquefied, and collects in the receiver. But should the apparatus be forced beyond its capacity, either by accident or design, provision is made to catch any steam that may have escaped the action of the analyzer. To this end there are three traps in the upper condenser coil, which collect this steam, condense it, and conduct it back to the analyzer.

The liquid anhydrous ammonia from the receiver then goes into the cooler, or refrigerator, where it is allowed to evaporate, producing intense cold; the heat necessary to enable it to flash into gas being supplied by non-congealable brine, which is pumped through a coil in the cooler. This brine then serves as a carrier of the cold to the chill rooms, cellars, or ice making tanks.

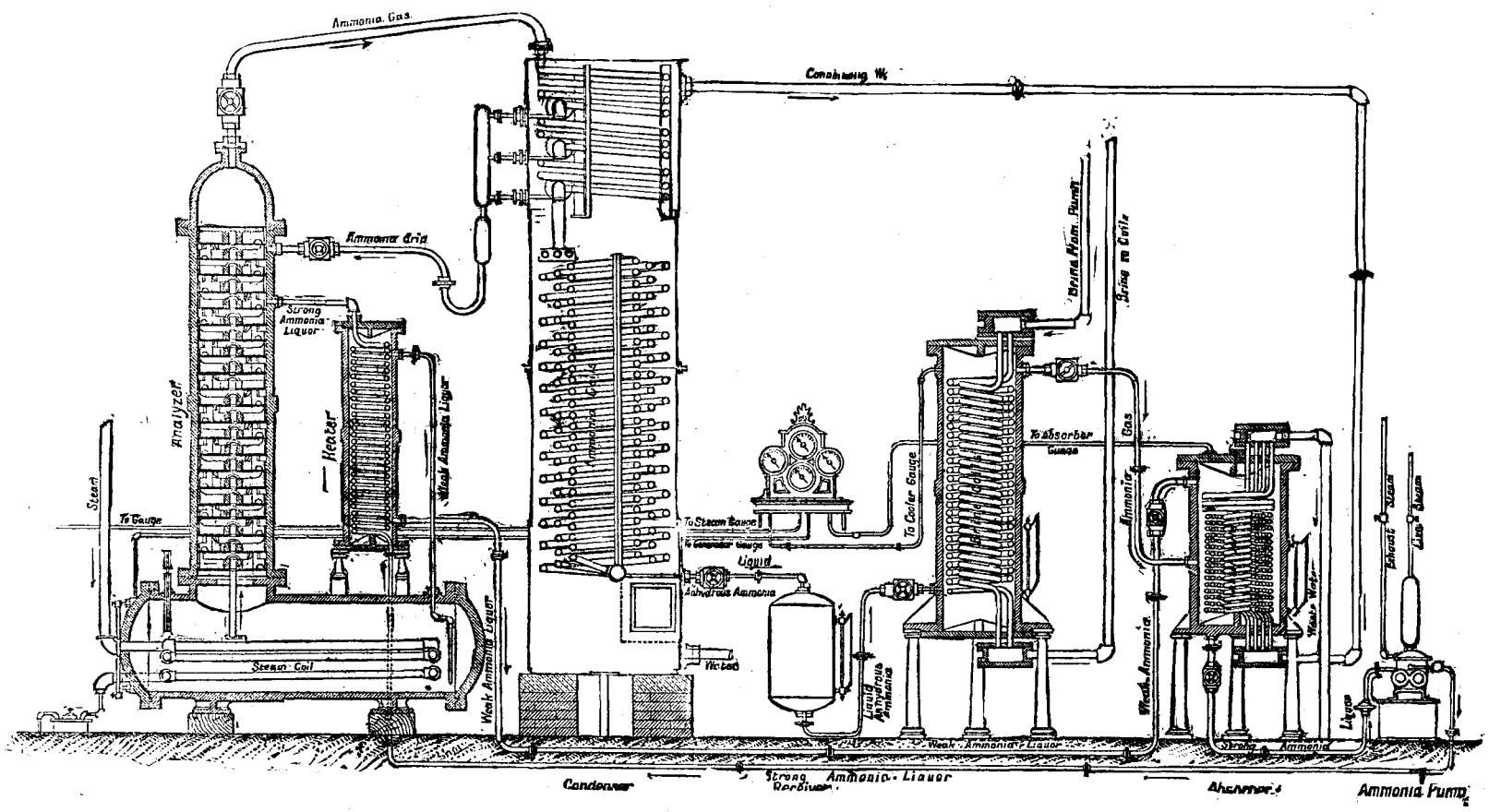
The anhydrous ammonia gas leaves the cooler at the top, and thence goes into the absorber; here it meets the mother liquor, or weak ammoniacal liquor, from the generator, which enters the absorber in the form of spray. This greedily absorbs the ammonia gas, forming strong ammoniacal liquor, which is pumped continuously from the absorber, by the ammonia pump, to the upper trays of the analyzer, where the greater part of the ammonia gas again leaves the liquor before reaching the generator, the ascending heat therefrom being sufficient to effect its distillation.

The process of absorption is facilitated by cooling the ammonia liquor, both weak and strong, by means of coils in the absorber, which are supplied by the overflow water from the condenser; hence it will be seen that the cooling of the absorber is obtained at no expenditure of water beyond what is necessary to supply the condenser of the machine. The Pontifex machine, therefore, uses no more condensing water than any of the machines of the compression type, for in these the water from the condenser simply runs to waste. This is an important advantage which the Pontifex possesses over other machines of its class.

The weak ammoniacal liquor from the generator, on its way to the absorber, passes through the heater and around a coil through which the strong ammoniacal liquor from the absorber is being pumped to the analyzer. Here an interchange of temperatures occurs, resulting in an economy of fuel, because the strong liquor is heated at the expense of the weak liquor, which is then enabled the more readily to perform its work of absorption.

The Pontifex machine is continuous and reliable in its operation, and thus solves the only problem in connection with the subject of ice making or refrigeration by the absorption process. If the liquid anhydrous ammonia in the cooler contains even a trace of water to say nothing of the 5 to 7 per cent which the advocates of rival systems claim must go over with the gas in an absorption machine, it would be simply a question of a few days or weeks before the cooler would be filled with water and the generator would be empty. From the relative location of the inlet and outlet pipes it will be seen that nothing can leave the cooler except in the form of ammonia gas, and the intense cold of the chamber would certainly prevent the water from evaporating if there were any there. Hence, in the Pontifex machine, this defect, so commonly urged against other machines of its class, would be especially fatal to its continuous operation for even a short time. The fact that it is continuous demonstrates amply the efficiency of the arrangement for securing perfectly anhydrous ammonia.

The capacity of these machines is from 5,000 lb. to 50,000 lb. of clear ice in twenty-four hours.




IMPROVED ICE MAKING MACHINERY.

### Vest Button Photography.

The process of instantaneous photographing is rapidly becoming an evil. We hear talk already about specialists in photography for instantaneous pictures since the "Detective Camera," as it is called, was put upon the market. The box is so small that it can be carried anywhere without the slighest inconvenience, and, as the little lens at the bottom is always ready for use, an instantaneous picture can be taken at any desired moment. There was some misgiving at first entertained about the value of these cameras, but we have recently seen some wonderful work produced by them. In the camera is a gelatine plate which can be turned six times, so that six photographs can be taken one after the other, and these pictures are so sharply defined that they can be enlarged tenfold. The inventor, Mr. Stirn, of New York, is a German by birth, and his brother, Mr. R. Stirn, of Bremen, sells the apparatus for about seven dollars (thirty marks), with a complete outfit. No operator is required to fit the camera and lens correctly in position for the party to be photographed. All that is requisite is to pull a string and the photograph is at once taken. With another pull the plate is made ready for another picture. We are told that the most prominent artists carry this detective camera with them at all times—A. Von Werner, Gussow, Thumann, O. Lessing, and others. This they do from a strictly professional point of view, and not as amateurs or dilettanti. In Germany, Herr Stirn recently produced before a photographic society enlargements to a size of forty centimeters from such pictures, and all were remarkably distinct and well defined. These plates can also be taken at different distances and always sharply outlined. Young men take their lady friends on promenade to be unconsciously photographed. People, young and old, who have never entered an artist's studio or a photographic gallery will be astonished to see their pictures freely circulated. Most of all, it is to be feared that the legitimate business of the photographer will be injured by these cameras. Any possible mania or desire for photos. can soon be gratified at trifling expense and after a short term of practice by means of this invention. Photographs can soon be so multiplied as to become a positive nuisance, and from the various considerations that enter into the matter, it does not seem so very easy to answer our query—"What next?"—*American Lithographer.*

### Improved Incandescent Lamps.

An incandescent electric lamp while in operation sets free or drives off from its filament more or less carbon in loose particles, which become deposited upon the inner surface of the globe and cloud it. The *Electrical World* says: Mr. Edward P. Thompson has found that such carbon is, for the most part, set free upon the closing and interrupting of the circuit, and that it is due to the static charge received by the lamp and to the discharge which takes place. In order to avoid this injurious action, Mr. Thompson has designed a lamp with means for discharging the high potential currents from the filament and preventing the free carbon from being thrown off, at the same time causing that which is thrown off to be deposited at points where it will not injure the light.

This is accomplished by inserting in the globe an independent conductor which is provided with points projected in opposite directions toward the respective arms of the filament, and connecting the same with the earth. A conductor extends into the globe between the two arms of the filament. This conductor is provided with sharp points of conducting material extending in opposite directions toward the respective arms of the filament, but not quite in contact therewith. The high potential currents or charges, especially such as are present upon the interruption of the circuit of the lamp, according to Mr. Thompson, tend to discharge across the arms of the filament to these points, and whatever loose carbon is thrown off at such time will tend to gather upon the inner conductor, rather than upon the surface of the globe.

### A Horse Killed by an Electric Motor Wire.

MONTGOMERY, Ala., July 25.—Gov. Seay met with a peculiar accident this afternoon. He and his private secretary, J. K. Jackson, were driving down the main street of the city, when one of the guy wires which support the overhead cable of the electric street railway broke and fell to the ground, striking the governor's horse. The wire was heavily charged with electricity, and the horse, becoming entangled, was shocked and burned to death in a few minutes.

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### Our Future Timber Supply.

Prof. Charles S. Sargent, one of the special agents of the tenth census, in his report on the forests of North America, gives it as his opinion that the forests of the United States, notwithstanding the great and increasing drains upon them, are capable of yielding annually, for many years longer, a larger amount of material than has yet been drawn from them, even with our present reckless methods of forest management. It is true that the great pine forest of the North has already suffered fatal inroads, that the pine that once covered New England and New York has disappeared, and that Pennsylvania is nearly stripped of what once appeared to be a nearly inexhaustible supply of the same wood. But the great northwestern pineries are not yet exhausted, and, with the newly introduced methods by which logs once supposed inaccessible are now profitably brought to the mills, they may be expected to increase the volume of their annual product for a few years longer in response to the growing demands of the great agricultural population which is fast covering the treeless mid-continental plateau.

The area of the pine forest, however, remaining in the great pine-producing States of Michigan, Wisconsin, and Minnesota is dangerously small in proportion to the country's consumption of white pine lumber, and the entire exhaustion of these forests in a comparatively short time is certain. The wide area now covered in New England by a vigorous second growth of white pine, although insignificant in growth and productiveness in comparison with the forests that it replaces, must not be overlooked in considering the pine supply of the country. These new forests, which are already yielding between two and three hundred million feet of timber annually, are capable of great future development.

The pine belt of the south Atlantic region still contains immense quantities of timber unequaled for all purposes of construction, although unsuited to take the place of the white pine of the North. The Southern pine forests, although stripped from the banks of streams flowing into the Atlantic, are practically untouched in the Gulf States, especially in those bordering the Mississippi River. These forests contain sufficient material to supply all possible demands that can be made upon them for a long time.

The hardwood forests of the Mississippi basin are still, in certain regions at least, important, although the best walnut, ash, cherry, and yellow poplar have been largely culled. Two great bodies of hardwood timber, however, remain, and upon these comparatively slight inroads have been made as yet. The most important of these forests covers the region occupied by the southern Alleghany mountain system, embracing southwestern Virginia, West Virginia, western North and South Carolina, and eastern Kentucky and Tennessee. Here oak unequaled in quality abounds, walnut is still not rare, although not found in any very large continuous bodies, and cherry, yellow poplar, and other woods of commercial importance are common. The second great body of hardwood, largely oak, is found west of the Mississippi River, extending from central Missouri to western Louisiana.

The forests of Michigan, especially those of the northern peninsula, still abound in considerable bodies of hardwood, principally maple. Throughout the remainder of the Atlantic region the hardwood forests, although often covering considerable areas, have everywhere lost their best timber, and are either entirely insufficient to supply the local demand of the present population, or must soon become so.

In the Pacific region, the great forests of fir which extend along the coast region of Washington Territory and Oregon are still practically intact. Fire and the ax have scarcely made a perceptible impression upon this magnificent accumulation of timber. Great forests of pine still cover the California Sierras through nearly their entire extent. The redwood forest of the coast, however, once, all things considered, the most important and valuable body of timber in the United States, has already suffered seriously, and many of its best and most accessible trees have been removed. This forest still contains a large amount of timber, although its extent and productive capacity have been generally exaggerated. The demand for redwood, the only real substitute for white pine produced in the forests of the United States, is rapidly increasing, and, even at the present rate of consumption, the commercial importance of this forest must soon disappear.

The pine forests that cover the western slopes of the northern Rocky Mountains and those occupying the high plateau and inaccessible mountain ranges of central Arizona and southwestern New Mexico have not yet suffered serious damage at the hands of man. The remaining forests of the Pacific region, of little beyond local importance, are fast disappearing. The area of these interior forests is diminished every year by fire and by the demands of a careless and indifferent population, and their complete extermination is probably inevitable.

The forest wealth of the country is still undoubtedly enormous. Great as it is, however, it is not inexhaustible, and the forests of the United States, in spite of their extent, variety, and richness, in spite of the fact that the climatic conditions of a large portion of the country are peculiarly favorable to the development of forest growth, cannot always continue productive if the simplest laws of nature governing their growth are totally disregarded.

The judicious cutting of a forest in a climate like that of the Atlantic or Pacific coast regions entails no serious or permanent loss. A crop ready for the harvest is gathered for the benefit of the community; trees that have reached their prime are cut instead of being allowed to perish naturally, and others take their place. The permanence of the forests in regions better suited for the growth of trees than for general agriculture may thus be insured. Two causes, however, are constantly at work destroying the permanence of the forests of the country and threatening their total extermination as sources of national prosperity—fire and browsing animals inflict greater permanent injury upon the forests of the country than the ax, recklessly and wastefully as it is generally used against them.

### The Electrical Lighthouse Lamp.

The third illuminant, electricity, has been known in England for about thirty-five years. As generated in the magneto-machines of Prof. Holmes, between 1853 and 1862, and as tried experimentally in the lighthouses of Dungeness and South Foreland, it was very small in dimension and very uncertain in character. Several forms of the light were suggested during this period, such as the voltaic arc of Watson and the mercurial electric lamp of Way. With the more effective alternating current machines, and with the larger carbons, of later years, the arc grew in power and dimension. At the present time carbons of from 25 to 40 millimeters are available, with an intensity in the focus of a light of ten times that of the most powerful gas or oil burner. The arc is thus become a most valuable resource, not merely for its unsurpassable power, but also for its focal adaptability to the usual dioptric apparatus, and to special optical combinations dictated by nautical circumstances. It is most flexible in its application. It radiates no harmful heat. It has the high merit of not exacting any abnormal dimensions of apparatus, lantern, or tower. Lastly, being the most powerful in all its gradations relatively to other illuminants, it is the cheapest of all lights if the cost of establishment and maintenance be computed in terms of the units of the beam transmitted, which is the only strictly logical and practical way of treating it. For these reasons it has been chosen in France as the best illuminant for a large number of coast lights, and it is making rapid way in Europe and America. It may therefore be safely asserted that the electric light, when it shall have been freed from its last disabilities and shall have attained its utmost development, will, in the not distant future, be the prevailing illuminant of our own lighthouses and of the other chief lighthouses of the world.

In illustration of the power of the electric arc with suitable optical treatment, I may mention that the direct beams of the Tino light, near Spezia, were observed on April 20, 1885, by Prof. Noceti, from the hill S. Giorgio, behind Savona, at an elevation of 2,733 feet and a distance of 73 statute miles, the atmosphere being clear and under moonlight. The beams of the arc were notably brighter than those of the *lanterna* at Genoa, at one-third of the distance. Frequent observations are reported of the Macquarie light in New South Wales, at ranges of 60, 65, and 70 nautical miles, by means of reflections on the sky while the light itself is below the horizon.—*J. Kennard, in Nature.*

### The Infant Rapidly Becoming a Giant.

The public expect much of improvements in which electricity is employed. Millions may be spent in digging a canal where the channel fills up from the slow movement of the soil as fast as it is removed by the dredging machines; failure after failure may be recorded in the annals of mining developments until success seems to be the exception; but let there be a failure of an electrical piece of mechanism, and every one wonders. In the early days of the development of the systems of electric lighting, storage, and transmission of power there were few failures, and those were instructive.

The first devices for automatically lighting and extinguishing gas were somewhat crude. Now, however, with careful installation, failure is unknown; yet ten years ago the great systems of lighting by electricity had only been dreamed of. It required thirty years to perfect the system of telegraphy. The methods used in gas making were not improved for a long period. And it is possible that the old process would have been in use for half a century longer if the competition of electric lighting had not necessitated improvements. So much has been accomplished that still more is expected of our electricians. The inventor or experimenter was once called a crank. Now large sums of money are expended yearly in systematic experimenting, the highest skill, education, and ability is employed, and the professors in the universities and technical schools are retained as consulting electricians.—*Elec. Review.*

### Enameled Letters.

The various methods of attracting attention by advertising have become one of the many indications of American enterprise, and it is a wide field, well calculated for the display of native ingenuity. Signs and placards are to be seen in every available place, forcing upon public notice the wonderful cures effected by a patent medicine or the merits of a new magic shoe blacking; and every conspicuous board, fence, or brick wall is sure to command a high price for the purpose. Paint and posters have been the principal agents in sign advertising, but they have faults in common, for if exposed to the weather for any length of time they soon become worn and unsightly; and so when a means of advertising at once durable and attractive was invented, it found the "long felt want" awaiting it. This was the invention of the white enameled letters, which have since become so popular and are to be seen on show windows in every city of the United States. These make the most attractive and neat letters possible to put on a window, for no one can pass by without noticing them.

The art of enameling was known before the Christian era, when its principal use was in the ornamentation of pottery, etc. For some years enameled clock dials have been in use, and in some instances a coating has been applied to the inside of pipes and baths. The enamel in these cases is made of soda and borax mixed with glass, the whole being reduced to a fine powder. The metal to be enameled is first cleaned by a weak solution of sulphuric acid, and gum water is then applied; the enamel is sifted on, the gum causing it to stick. It is next placed in a furnace kept at a very high temperature, and the vitreous enamel is fused and flows equally over the whole surface of the metal. When cool, if properly done, the enamel will have a peculiar glassy surface. The black figures of the clock dial are made of what is known as thin enamel, which somewhat resembles paint. It is applied by a camel's hair pencil and the whole is again placed in the furnace and baked, and the black figures are thus fastened on and become a part of the white foundation enamel, without losing their shape or color.

The process of making the letters is much the same, oxide of tin being mixed with the glass to give the opaque white appearance. The base is stamped out of copper in the required shape, and upon this the enamel is built up. It is found necessary to apply two coatings to obtain the smooth glaze, and a rough coating of enamel is also applied to the under side of the letter.

Another method of making enamel is by mixing 30 parts saltpeter, 90 of silica, and 250 of litharge. White is the color in general use, but when others are required they are obtained from the metallic oxides, blue from oxide of cobalt, green from oxide of chromium, etc.

The most difficult thing about the manufacture is to apply just the right amount of heat, for, if left in the furnace a little too long, the letters will crack; but if the heat is not quite strong enough, the glaze will be lacking. Before the letters are yet ready for the market, they must be filed around the edges to render them smooth.

Enameled letters were first made some twenty years ago in Germany, but the invention was not pushed, and it was introduced in this country about 1879, by a large firm engaged in the manufacture of metal and glass letters and other kinds of signs. The manufacture of the letters is for the most part confined to the city of New York, where six or seven firms are engaged in the business. The field is naturally limited, as a sign once put up is likely to last as long as it is needed; but as yet the demand is increasing, and large orders come in from Canada and South America, as well as from the Western States.

The making of these letters cannot, of course, be patented, but the skill required both in the baking and in making the enamel confines the business to a few.

There is a patent, however, on one kind of letter, which is concave or hollow, and it is claimed that this possesses advantages over the ordinary flat letter, but there is little doubt that either style will, if properly put up, prove satisfactory and serviceable. It is not to be denied that the letters do sometimes drop off, but in such cases the fault rests with the person by whom they are put up. A good cement for the purpose is made of four parts of white lead and one part of Indian red, mixed with copal varnish thoroughly until it attains the consistency of soft putty.

Enameled iron signs, such as are used on the platform railings of the elevated railways in New York for station names and advertisements, are made on the general principle of clock dials. They are all manufactured in Birmingham, England, where there is a large factory for the purpose. Various colors are used, but white lettering on a foundation of blue enamel is most popular.

Enameling of late has been applied to the manufacture of street names, park notices, numbers, "push" and "pull" plates, labels, and in all cases where a neat, attractive, and durable sign is desirable.—*American Stationer.*

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### ENGINEERING INVENTIONS.

A bridge plate for railway joints, etc., has been patented by Mr. Thomas J. Bush, of Lexington, Ky. It is made with curved strengthening flanges and flat surfaces, in combination with clamp plates and interlocking bolts, making an elastic truss calculated to adapt itself to the wave of deflection as the wave passes through the joint of the track.

A car axle box has been patented by Mr. Charles E. Candee, of New York City. It is a reversible internally chilled axle box cast all in one piece, and so made that its interior walls present upper and lower chilled bearing surfaces integral with the shell of the box, the invention relating more particularly to roller-bearing axle boxes for railroad car wheel axles.

A car axle has been patented by Mr. John Pettinger, of Santa Barbara, Cal. Combined with a tubular spindle are sleeves carrying the wheels and journals, a dust cap, and other novel features, the invention relating to that class of axles which permit the independent turning of the wheels, and combining lightness with durability and simplicity of parts.

A car brake has been patented by Mr. Robert H. Dement, of Hudson, Ill. The invention consists of a crank disk secured to the lower end of a brake staff and connected with the brake lever rod, a spring pressing against the lower end of the brake staff, and a stop pin being secured to the crank disk to limit its motion, whereby the brake staff is given only one half of a revolution and is then automatically held in place.

A propelling and steering apparatus for vessels has been patented by Mr. Carl C. L. Lucht, of Colberg, Prussia, Germany. The invention relates to that class of devices in which pairs of hinged wings are used, which automatically separate when moved in one direction and swing together when moved in the opposite direction, whereby the course of the vessel can be regulated from the upper deck, and its direction reversed without reversing the engine.

### AGRICULTURAL INVENTIONS.

A combined planter and fertilizer distributer has been patented by Mr. Charles T. Waters, of Butler, Ga. The invention covers a novel construction and combination of parts in a machine that is intended to plant cotton seed, seed corn, peas, etc., and to drop or distribute fertilizers.

A planter and roller has been patented by Messrs. William H. Littell and John R. Scofield, of Charles City, Iowa. It is so made that the weight of the driver, when the dropper is off, will elevate the flukes clear from the ground, the machine being easily turned at the end of a row, while the roller can be readily detached and used separately.

A grass killer has been patented by Mr. Jordan P. Mathis, of Bently, Miss. It consists of a blade to be used with a plow stock or in a similar way, the blade being formed of a plate curved from edge to edge and cut out in the center to form side plates, and also having rear diverging blades, the side blades straddling the row of plants and cutting the grass close to and upon both sides, and the device being very cheap, simple, and effective.

### MISCELLANEOUS INVENTIONS.

A sign has been patented by Mr. William B. Atkinson, of Franklin, Ky. It is more especially designed for jewelry or watchmakers' establishments, and consists of a case with dials whose hands are moved by an inclosed wind wheel.

A drag saw has been patented by Mr. Phillip Thurman, of New Florence, Mo. It is made with a vertically slotted standard in which the saw works, being held down within the cut by the action of springs, the device being held in position for its work by a dog.

A wind vane motor for clocks has been patented by Mr. Adrian Hitt, of Rushville, Ind. It consists of an upright shaft carrying a wind vane, and in gear wheels and shafts by which the power is transmitted to wind the mechanism of a time piece and also to indicate on a dial the direction of the wind.

An ox bow has been patented by Mr. Luman Rundell, of New Baltimore, N. Y. It is formed of wooden arms and a tubular metallic middle section, having an outwardly bowed lower central portion, so that it will not bear upon the windpipe or the veins or arteries of the neck.

A Venetian blind has been patented by Mr. Frank A. Howson, of Brooklyn, N. Y. The slats are so formed as to provide for the rolling or sliding of the blinds into properly arranged housings located at either the top or the bottom of the window in connection with which the blinds are arranged.

A vinaigrette, or perfume holder, has been patented by Mr. Charles E. F. Lewis, of Brooklyn, N. Y. This invention covers a novel design of such article, in which means are provided whereby the stopper will be held in connection with the article when removed, and in convenient position for replacement.

A combined tenoning and mortising machine has been patented by Mr. Joseph Du Franes, of North Topeka, Kansas. The invention covers a novel construction, combination, and arrangement of parts in a foot power machine, which also has a special feed mechanism and means for holding and placing the cutters.

A tool handle has been patented by Mr. William Millspaugh, of Middletown, N. Y. Combined with such handles as those of shovels, having a central grip supported by side arms, this invention provides for splitting them longitudinally and inserting a strengthening plate, clamped therein by rivets or otherwise.

A tool grinder has been patented by Mr. Norman C. Stiles, of Middletown, Conn. Combined with a grinding wheel stand having a hood is an apron mounted to slide on the hood, a perforated U-shaped tube on the lower edge of the apron, with screws for closing the ends of the U-shaped tube, with other novel features.

A chimney holder for lamp burners has been patented by Mr. George E. Oliver, of Magog, Quebec, Canada. The burner has two or more fixed fingers, combined with a movable finger having an inwardly projecting portion, and a lever for engaging the inwardly projecting portion of the finger to lock the latter in position, with other novel features.

A feed rack has been patented by Mr. James R. Logan, of Fargo, Dakota Ter. It is so made that the animal may insert his head and reach far back within the rack, and withdraw his head with some fodder in the mouth, the withdrawal of any other excess of fodder is prevented, thus allowing free feeding, but preventing waste.

An animal trap has been patented by Mr. John Nuding, of Kloeppel, Dakota Ter. The invention relates to spring jaw traps in which the trigger is tripped by the animal attacking the bait on the trigger plate, and it is so made that the trap may be set without the operator touching the trigger or passing his fingers between the jaws.

A finder for photographic cameras has been patented by Mr. John J. Higgins, of New York City. It has a duplex finder, with finder box having horizontal and vertical view apertures and movable mirror, with other novel features, for facilitating the taking of instantaneous pictures of objects in motion, or for finding objects in advance of or at the time of operating the shutter.

A combined envelope and tag has been patented by Messrs. Marcus L. Whitney, of Minneapolis, Minn., and Galen B. Whitney, of Port Jervis, N. Y. It is formed of a blank of paper, with its main body pieces adapted to be folded together and jointed at their edges to form an envelope, another part of the blank being adapted to form a tag, affording a convenient means of sending bills, etc., with the object to which the tag is attached.


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CIVIL AND MECHANICAL ENGINEERING POPULARLY AND SOCIALLY CONSIDERED. J. W. C. Haldane, C.E. & M.E. London, 1887. E. & F. N. Spon. Pp. xv., 442.

The graphic description of the life of a mechanical engineer and of its achievements, with special reference to the building of ocean steamships or "liners," forms the substance of this book. The salient features of the work of a constructing and consulting marine engineer, professional anecdotes, stories of the errors of engineering, are included, and make a most interesting volume. Beginning with the early history of steam navigation, its different phases of development are traced, from the original types of engine—side lever, steeple, etc.—to the introduction of the present compound engine. The slowness with which the last named obtained a hold upon the shipping industry is told, and forms a striking illustration of conservatism in the face of improvement. Though a popular work, and not dealing with the scientific aspect of the case, the author has produced a work that all young engineers will find of value from the knowledge of human nature, as exemplified in the engineering world, that the author displays. Nine very beautiful plates in autotype illustrate various typical factories, workshops, or ships, etc.

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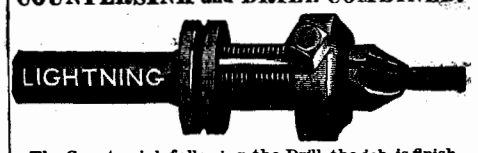

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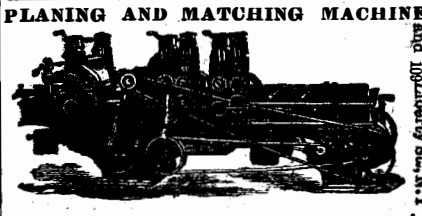
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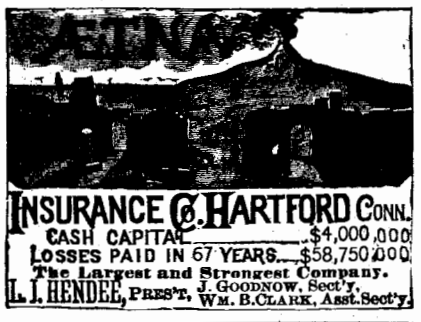
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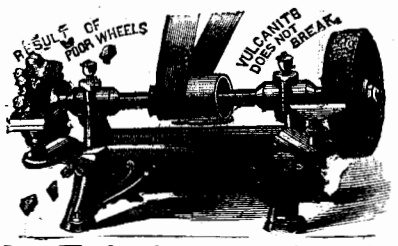


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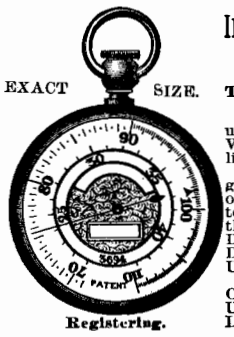


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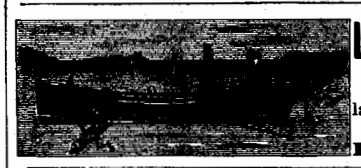

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### Proposals for Steel-cast Guns for the Navy.

NAVY DEPARTMENT,
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Under authority conferred by the act of Congress, approved March 3, 1887, making an appropriation "for the purchase and completion of three steel-cast, rough-bored and turned, six-inch, high-power rifle cannon, of domestic manufacture, one of which shall be of Bessemer steel, one of open-hearth steel, and one of crucible steel," sealed proposals from domestic manufacturers, to furnish the same, will be received at this Department until Tuesday, the second day of August, 1887, at 12 o'clock noon, at which time the proposals will be opened.

Proposals may be made either to furnish three completely finished six-inch, breech-loading, high-power rifle cannon, made from unforged castings, one of Bessemer steel, one of open-hearth steel, and one of crucible steel, or three unforged, rough-bored and turned castings for such cannon, of the same material, respectively, to be finished by the Department in accordance with the bidder's design.

* * * * * * *

No gun or casting for a gun will be paid for until the gun "shall have been completed and have successfully stood the statutory test required by the act of July twenty-sixth, eighteen hundred and eighty-six," entitled "an act making appropriations for the naval service for the fiscal year ending June thirtieth, eighteen hundred and eighty-seven, and for other purposes." [For statement of requirements of said tests, and of other conditions to be observed, reference is made to "specifications" which can be had upon application to the Department.]

Proposals may be made for one or more guns or for one or more castings as aforesaid, * * * [but must be made separately for each gun, or casting for a gun, and upon forms prepared by the Department.]

Each successful bidder will be required to execute, within fifteen days after notice of award, a formal contract in accordance with his proposal, and to furnish a bond, with satisfactory sureties, in a penal sum equal to fifteen per cent. of the amount of his bid, conditioned for the faithful performance of such contract.

Copies of the specifications, with blank forms of proposals, and all additional information desired, can be obtained on application to the Bureau of Ordnance, Navy Department.

All proposals must be in duplicate, inclosed in envelopes marked "Proposals for Steel-cast Cannon," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The right is reserved to waive defects in form and to reject any or all bids.

WILLIAM C. WHITNEY,
*Secretary of the Navy.*

NAVY DEPARTMENT,
WASHINGTON, D. C., *July* 20, 1887.

In order to give more time to domestic manufacturers to consider the matter, the period limited for the reception of proposals for steel cast guns is hereby extended, and such proposals will be received, under the foregoing advertisement, as modified, until Tuesday, September 20, 1887, at 12 o'clock noon, at which time the proposals will be opened.

WILLIAM C. WHITNEY,
*Secretary of the Navy.*

### Proposals for three Overhead Travelling Cranes complete, three Supports for such Cranes, and one Iron Frame for a Building.

NAVY DEPARTMENT,
WASHINGTON, D. C., *July* 23, 1887.

Sealed proposals will be received at the Navy Department, Washington, D. C., until 12 o'clock noon, on Thursday, the 15th day of September, 1887, at which time and place they will be opened in the presence of bidders, for furnishing the necessary material and labor and constructing, delivering and erecting the iron work for the supports of three overhead travelling cranes, the frame of one building, and three overhead travelling cranes complete, including attachments pertaining thereto, for the Ordnance Gun-shops at the Navy Yard, Washington, D. C., in accordance with plans which may be seen, and specifications, copies of which, together with all other information essential to bidders, may be obtained at the Office of the Civil Engineer at said Navy Yard. Proposals must be made in accordance with forms which will also be furnished on application to that Office.

Proposals must be made in duplicate and inclosed in envelopes marked "Proposals for Overhead Travelling Cranes complete, for Iron Supports for such Cranes, and Iron Frame for a Building," and addressed to the Secretary of the Navy, Navy Department, Washington, D. C.

The Secretary of the Navy reserves the right to reject any or all bids, as, in his judgment, the interests of the Government may require.

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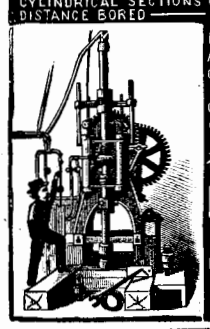

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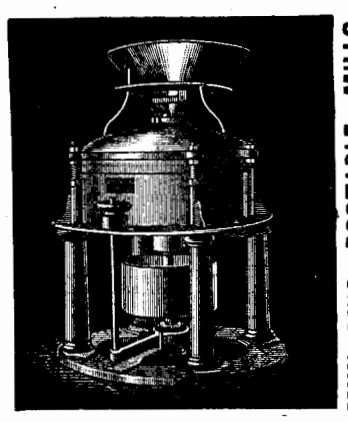

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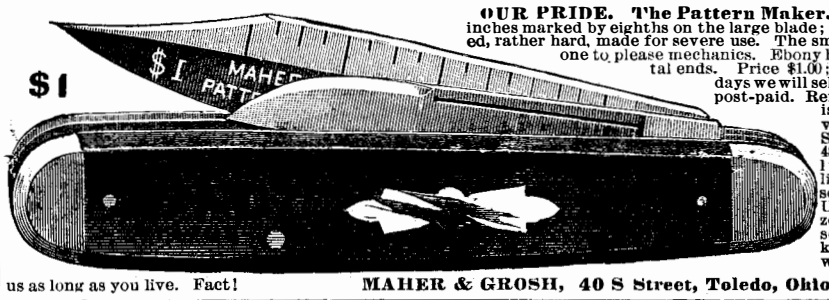


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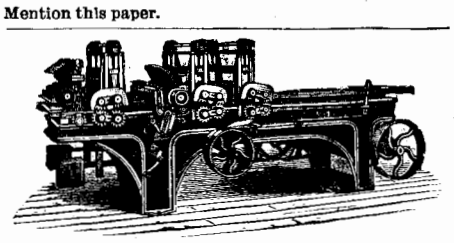

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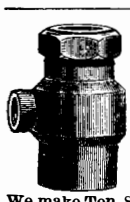

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